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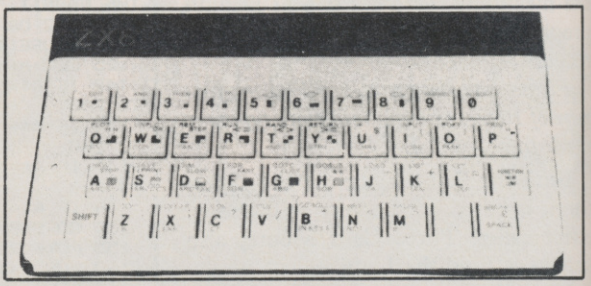

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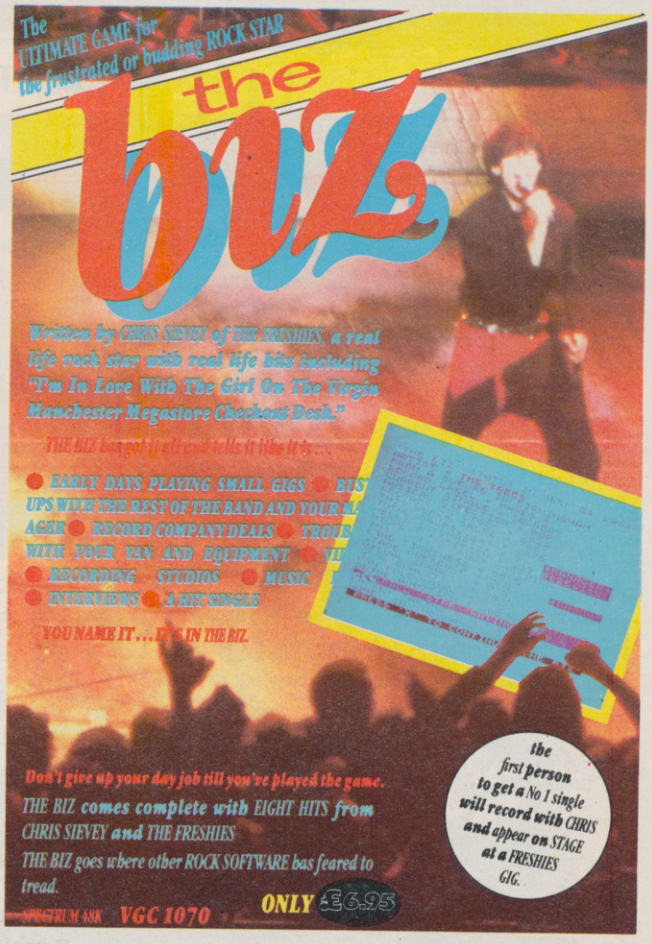
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VISA Access

continued from page 145

top of the pack. Now place the other, shuffled, cards on top.

You are now ready to begin. Pick up the deck and show that all the cards are different. Do not alter the order of the cards. Note where the two jokers are, cut the pack at that point and hand the top half to someone to shuffle — these will be the cards that you removed to set up, at the beginning. The remaining cards are returned to the table.

The rest of the instructions are contained within the program.

Computer Magic — Amazing Tricks on the ZX-81, by David Hambly. Price £3.00 from Martin Breese Publishing Ltd, 31, Richmond Way, Hammersmith, London W14.

The programs within the book will run on the Sinclair Spectrum.

Telepathic Computer

```
  2 BORDER 4: PAPER 7: INK 0: C
LS
  3 PRINT  INK 1;AT 10,6;"TELEP
ATHIC COMPUTER.";AT 12,9; INK 3;
"(A CARD TRICK)";AT 21,0; INK 0;
 Sheer Magic Software. 1984."
  4 GO SUB 9000
  5 PRINT AT 2,7;: GO SUB 570
  6 PAUSE 200
  8 GO SUB 110
  9 CLS
 10 LET q$="THE ACE OF SPADES"
 11 LET W$="THE TWO OF SPADES"
 12 LET E$="THE THREE OF SPADES
"
 13 LET R$="THE FOUR OF SPADES"
 14 LET T$="THE FIVE OF SPADES"
 15 LET Y$="THE SIX OF SPADES"
 16 LET U$="THE SEVEN OF HEARTS
"
 17 LET I$="THE EIGHT OF HEARTS
"
 18 LET O$="THE NINE OF HEARTS"
 19 LET P$="THE TEN OF HEARTS"
 20 LET A$="THE JACK OF HEARTS"
 21 LET S$="THE QUEEN OF HEARTS
"
 22 LET D$="THE KING OF HEARTS"
 23 LET F$="THE ACE OF CLUBS"
 24 LET G$="THE TWO OF CLUBS"
 25 LET H$="THE THREE OF CLUBS"
 26 LET J$="THE FOUR OF CLUBS"
 27 LET K$="THE FIVE OF CLUBS"
 28 LET L$="THE SIX OF CLUBS"
 29 LET Z$="THE SEVEN OF CLUBS"
 30 LET X$="THE EIGHT OF DIAMON
DS"
 31 LET C$="THE NINE OF DIAMOND
S"
 32 LET V$="THE TEN OF DIAMONDS
"
 33 LET B$="THE JACK OF DIAMOND
S"
 34 LET N$="THE QUEEN OF DIAMON
DS"
 35 LET M$="THE KING OF DIAMOND
S"
 38 PAPER 7: BRIGHT 1: CLS
 39 POKE 23609,255
 40 BEEP .05,4: PRINT '''' INK
2;"I WILL TELL YOU THE NAME OF T
HE CHOSEN CARD"
 42 PAUSE 150
 45 BEEP .05,5: PRINT : PRINT
INK 1;"TAKE A CARD AND REMEMBER
IT"
 47 PAUSE 150
 50 BEEP .05,6: PRINT : PRINT
INK 0;"THINK HARD OF YOUR CARD"
 55 PAUSE 100
 57 PRINT ''' INK 1;"(7*sp)ABE(
3*sp)"; INK 4;"FGO(3*sp)"; INK 3
;"PQR"
 58 PRINT  INK 2;"(7*sp)I"; INK
 6;"JK(3*sp)"; INK 2;"I"; INK 6;
"JK(3*sp)"; INK 2;"I"; INK 6;"JK
"
 59 PRINT  INK 2;"(7*sp)LM"; IN
K 6;"N(3*sp)"; INK 2;"LM"; INK 6
;"N(3*sp)"; INK 2;"LM"; INK 6;"M
"
 68 BEEP .05,7: PRINT : PRINT :
 PRINT  INK 6; PAPER 0; FLASH 1;
"PRESS ANY KEY WHEN YOU ARE READ
Y"
 70 PAUSE 0
 71 CLS
 75 GO TO 80
 80 IF INKEY$="q" THEN  PRINT '
'''"A S ";,,Q$
 81 IF INKEY$="w" THEN  PRINT '
'''"2 S S ";,,W$
 82 IF INKEY$="e" THEN  PRINT '
'''"3 S S S ";,,E$
 83 IF INKEY$="r" THEN  PRINT '.
'''"4 S S S S ";,,R$
 84 IF INKEY$="t" THEN  PRINT '
'''"5 S S S S S ";,,T$
 85 IF INKEY$="y" THEN  PRINT '
'''"6 S S S S S S ";,,Y$
 86 IF INKEY$="u" THEN  PRINT '
''' INK 2;"7 H H H H H H H ";,U$
 87 IF INKEY$="i" THEN  PRINT '
''' INK 2;"8 H H H H H H H H ";,
I$
 88 IF INKEY$="o" THEN  PRINT '
''' INK 2;"9 H H H H H H H H H "
;,O$
 89 IF INKEY$="p" THEN  PRINT '
''' INK 2;"T H H H H H H H H H H
";,P$
 90 IF INKEY$="a" THEN  PRINT
INK 1;'''"(3*sp)ABE",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;A$
 91 IF INKEY$="s" THEN  PRINT '
'' INK 4;"(3*sp)FGO",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;S$
 92 IF INKEY$="d" THEN  PRINT '
'' INK 3;"(3*sp)PQR",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;D$
 93 IF INKEY$="f" THEN  PRINT '
'''"A C ",,;F$
 94 IF INKEY$="g" THEN  PRINT '
'''"2 C C ",,;G$
 95 IF INKEY$="h" THEN  PRINT '
'''"3 C C C ",,;H$
 96 IF INKEY$="j" THEN  PRINT '
'''"4 C C C C ",,;J$
 97 IF INKEY$="k" THEN  PRINT '
'''"5 C C C C C ",,;J$
 98 IF INKEY$="l" THEN  PRINT '
'''"6 C C C C C C ",,;L$
 99 IF INKEY$="z" THEN  PRINT '
'''"7 C C C C C C C ",;Z$
 100 IF INKEY$="x" THEN  PRINT '
''' INK 2;"8 D D D D D D D D ",;
X$
 101 IF INKEY$="c" THEN  PRINT '
''' INK 2;"9 D D D D D D D D D "
,;C$
 102 IF INKEY$="v" THEN  PRINT '
''' INK 2;"T D D D D D D D D D D
";,V$
 103 IF INKEY$="b" THEN  PRINT
INK 1;'''"(3*sp)ABE",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;B$
 104 IF INKEY$="n" THEN  PRINT '
'' INK 4;"(3*sp)FGO",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;N$
 105 IF INKEY$="m" THEN  PRINT '
'' INK 3;"(3*sp)PQR",,; INK 2;"(
3*sp)I"; INK 6;"JK",,; INK 2;"(3
*sp)LM"; INK 6;"N",,; INK 0;M$
 106 FOR i=1 TO 20
 107 BEEP .015,RND*40
 108 NEXT i
 109 PAUSE 300: GO TO 38
 110 CLS : PRINT AT 18,0;"Press
C for another go","Press S for t
he secret"
 115 PAUSE 0
 120 IF INKEY$="c" THEN  RETURN
 125 IF INKEY$="s" THEN  GO TO 1
50
 150 CLS
 155 PRINT "Each(2*sp)key(2*sp)h
as been allocated a card.(2*sp)T
his has been done in an easy to
remember order. Startingwith ""A
"" for the ACE OF SPADES, then "
"W"" for the TWO OF SPADES  and
so on. Because only 26 keys are
available, so only 26 cards are
named. (Check the listing to mak
e this clearer)"
 160 PRINT : PRINT "Start(2*sp)b
y(2*sp)having(2*sp)the named 26
cards, on the top of the deck.(2
*sp)Have(2*sp)someone(2*sp)cut o
ff this top half,and for them to
 shuffle the cards.(2*sp)Now get
 them to pick a card.(2*sp)Once
you have discovered what it is,
you will know which key to press
, for the card to be revealed."
 170 PRINT TAB 10; INK 2; FLASH
1;"SHEER MAGIC"
 180 PRINT "Press 0 to return"
 182 PAUSE 0
 185 IF INKEY$="0" THEN  RETURN
 570 PRINT ''' INK 1;"(7*sp)ABE(
3*sp)"; INK 4;"FGO(3*sp)"; INK 3
;"PQR"
 580 PRINT  INK 2;"(7*sp)I"; INK
 6;"JK(3*sp)"; INK 2;"I"; INK 6;
"JK(3*sp)"; INK 2;"I"; INK 6;"JK
"
 590 PRINT  INK 2;"(7*sp)LM"; IN
K 6;"N(3*sp)"; INK 2;"LM"; INK 6
;"N(3*sp)"; INK 2;"LM"; INK 6;"M
"
 600 RETURN
9000 RESTORE : FOR n=1 TO 20: RE
AD p$
9010 FOR f=0 TO 7
9020 READ a: POKE USR p$+f,a
9030 NEXT f
9040 NEXT n
9050 DATA "h",0,0,54,62,28,8,0,0
9055 DATA "d",0,0,8,28,62,28,8,0
9060 DATA "c",0,0,28,42,62,42,8,
0
9065 DATA "s",0,0,8,28,62,54,8,0
9070 DATA "t",0,94,82,82,82,82,9
4,0
9075 DATA "a",0,0,243,121,63,31,
15,7
9080 DATA "b",0,0,231,231,255,25
5,255,255
9085 DATA "e",0,0,207,158,252,24
8,240,244
9090 DATA "i",4,12,14,16,32,64,8
4,56
9095 DATA "j",84,85,42,21,10,10,
10,5
9100 DATA "k",160,80,144,88,164,
172,162,86
9105 DATA "l",8,4,24,16,16,15,1,
2
9110 DATA "m",5,5,5,29,98,191,0,
0
9115 DATA "n",82,86,82,82,212,88
,232,4
9120 DATA "f",0,0,240,121,63,31,
15,7
9125 DATA "g",0,0,195,231,255,60
,255,255
9130 DATA "o",0,0,15,158,252,248
,240,224
9135 DATA "p",0,0,255,121,48,16,
9,7
9140 DATA "q",0,0,255,231,195,19
5,231,25
9145 DATA "r",0,0,255,158,12,8,1
44,224
9150 RETURN
```

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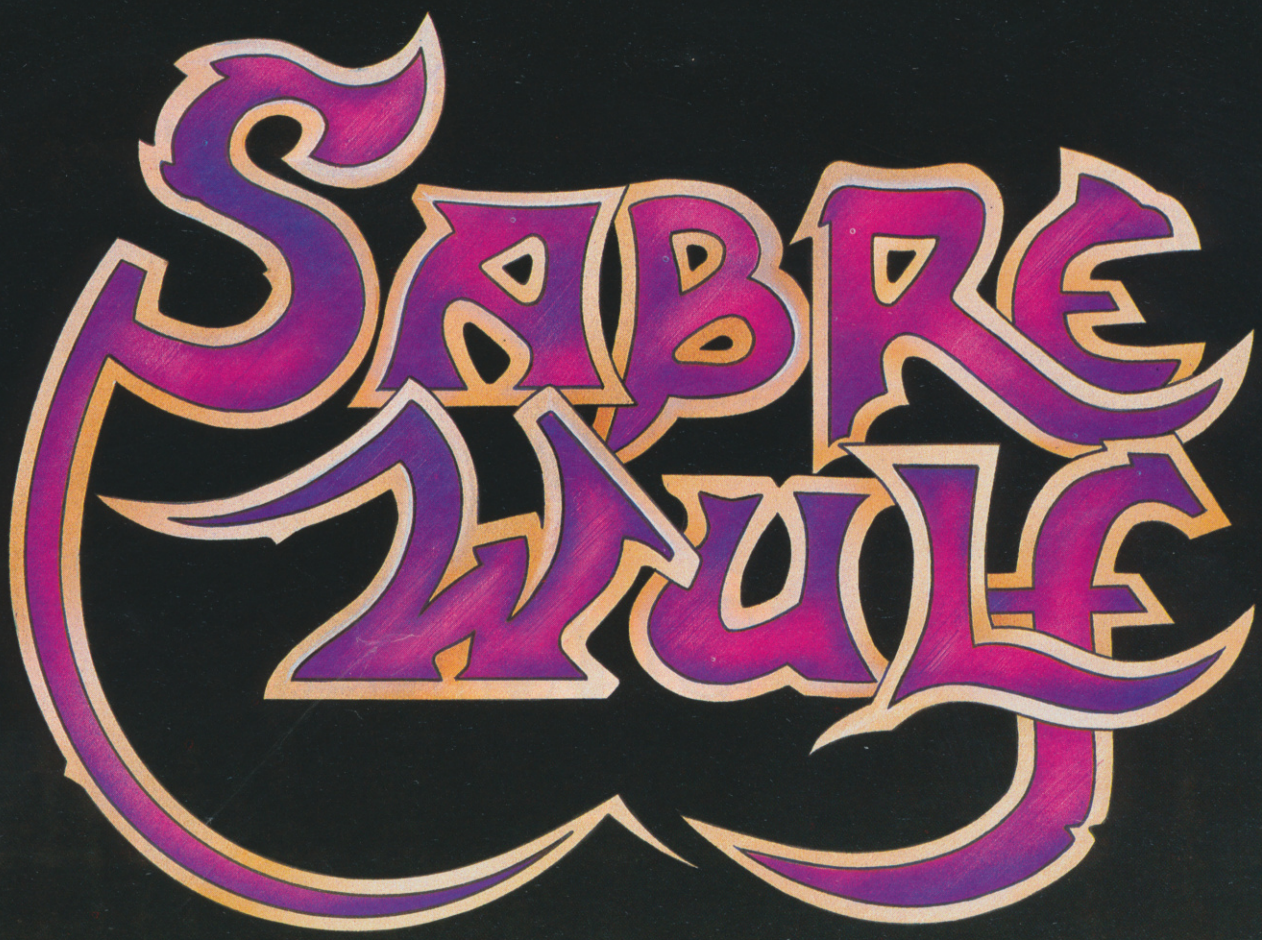

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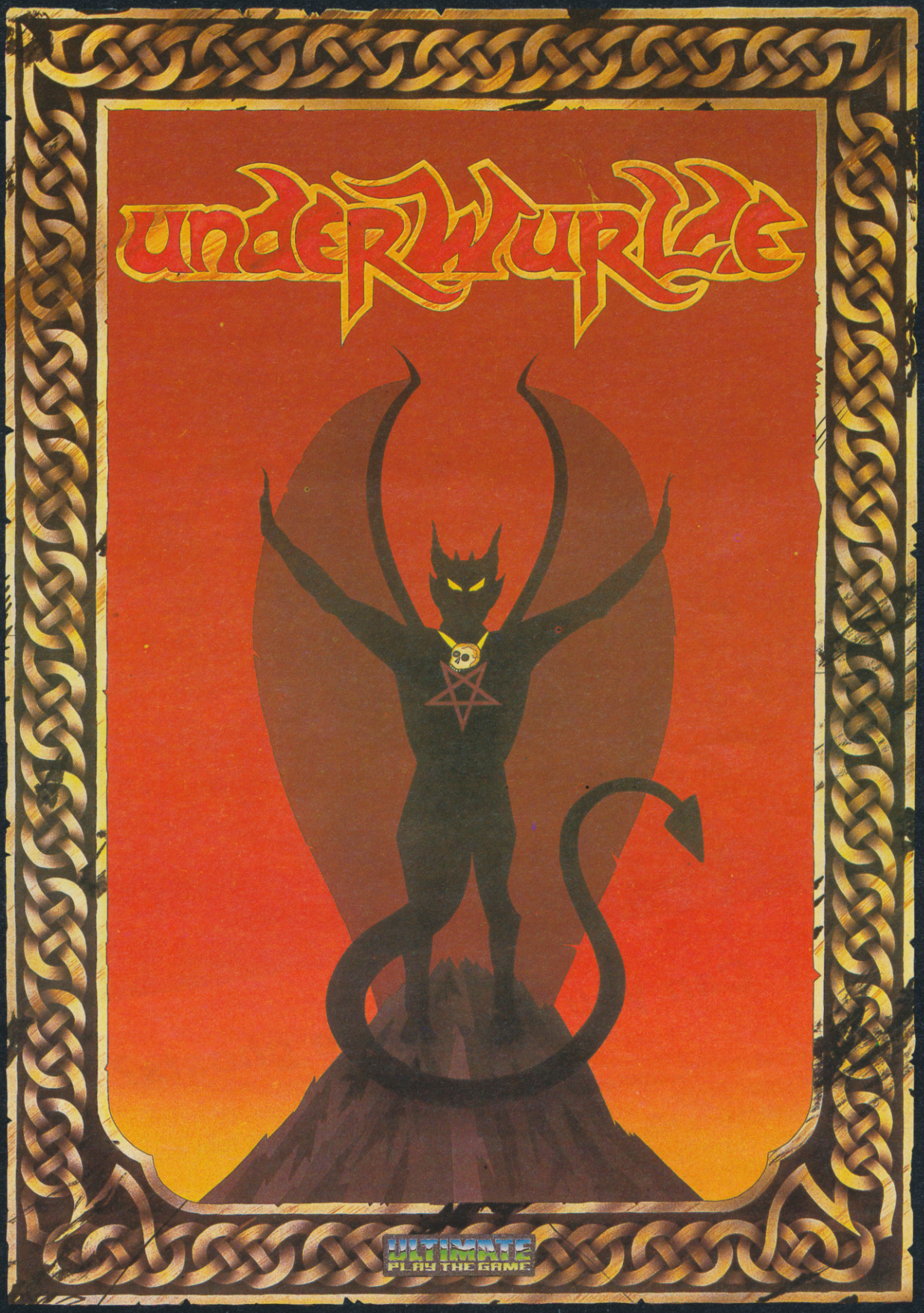

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Coinciding with the release of the film, leading software manufacturer Activision is launching the computer game version for the Spectrum. Designed by *Decathlon* creator David Crane, the game is a mixture of adventure, strategy and arcade action in which it is up to you to infiltrate the evil Temple of Zuul and save the world. Armed with ghost vacuums, bait and traps you patrol the streets sucking up Slimers and Roamers and avoiding the dreaded Marshmallow Man. The game also features the *Ghostbusters* music and high-quality graphics.

We are giving away 100 copies of *Ghostbusters* to the winners of our festive supernatural quiz. All you have to do is some ghost busting of your own and identify the whereabouts of five famous spectres. Clues are given opposite. Write the answers, which should be the titles of a book, play, record, song and computer game — on a postcard together with your name, address and telephone number. Post it to: Ghostbusters Competition, *Sinclair User,* EMAP Publications, 67 Clerkenwell Road, London EC1R 5BH, to arrive not later than Friday, December 21. The first 100 correct entries pulled from the bag after that date will win the games.

Employees of EMAP Publications and Activision (UK), their relatives and associates are ineligible. Only one entry per person is permitted and the judges' decision is final.

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Designed exclusively for the ZX Spectrum, Protocol 4 brings you game control customising in a way that no other interface does. It can accept all commercially standard joysticks, including the Quickshot II with 'rapid fire' or Trackball controllers, and is compatible with ALL Spectrum software. **OPERATES LIKE FIXED OPTION INTERFACES OR CAN BE FULLY HARDWARE PROGRAMMED**

The flexibility of Protocol 4 control is achieved by a specially designed 'CustomCard' system. CustomCards are easily programmed to suit all types of games.

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Utilising Hardware Programmed technology you have the benefit of automatic eight direction control, no power-down programming loss, guaranteed conflict-free operation with other peripherals, including microdrives, and no extra software to load or awkward joystick movements and key presses to make each time you load another game. The keyboard remains fully operative at all times.

It is also perfectly possible to connect up to five Protocol 4's on one Spectrum, each programmed separately, for multiple player control — only possible with the hardware programmed design.

Incorporated into the design is a computer Reset button for clearing the computer memory between games without pulling the power plug out.

Fully guaranteed for 18 months, Protocol 4 comes supplied with five CustomCards, ten Quick Reference Programming Cards and complete instructions.

PROGRAMMABLE INTERFACE

As the first fully hardware programmed joystick interface, this product has become well established over the past year and will accept ALL standard joysticks or trackballs, including Quickshot II with 'rapid fire', for use with ALL Spectrum or ZX81 software — not just those with a joystick option.

* No Software programming required.
* Programming is *not* lost when power is disconnected between games.
* Eight way movement — with or without the fire button pressed — only requires setting of the four normal directions.
* Compatibility is guaranteed with ALL key reading techniques — machine code or BASIC.
* Several interfaces can be separately programmed and fitted to one computer for multiple player games.
* Keyboard operation is totally unaffected by this interface, as with all AGF add-ons, and will never conflict with *any* other device fitted at the same time.
* Twelve months guarantee, key programming information and a pack of Quick Reference Cards, to speed up setting of the clips, are supplied with full instructions.

INTERFACE II

The AGF Interface II represents the best low cost introduction to joystick control.

The 'AGF' control standard is now offered by over 100 games or utility programs for use with any joystick or trackball.

Any game which is controlled by the cursor movement keys (5,6,7,8) or has a Protek option is also compatible with Interface II.

A rear connector allows other peripherals to be connected at the same time.

This product is available for either the Spectrum or ZX81, is supplied with full instructions, a 12 month guarantee, and a 12½% discount voucher against further AGF mail-order purchases.

ROMSLOT

The new AGF RomSlot is designed for anyone who already owns a programmable joystick interface, or prefers to use the keyboard to control games, and would like to add the facility of ROM cartridge software to their system.

RomSlot will accept the Sinclair range of instant loading games and will also be compatible with the new releases from Parker Software — exciting new games only to be available in ROM format.

This system allows instant play. Your computer memory size is not important and you will be able to play games that could ordinarily require more RAM.

RomSlot incorporates an extra feature called 'Restart'. This allows you to instantly *restart* the ROM game.

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QUICKSHOT

The Quickshot joystick is an excellent value game controller incorporating suction cups for sure-footed precision with a comfortably contoured handle offering a convenient top firing button as well as one on the base.

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Quickshot II has improved styling with a trigger type firing button as well as the top firing action, with a broader base for greater suction stability.

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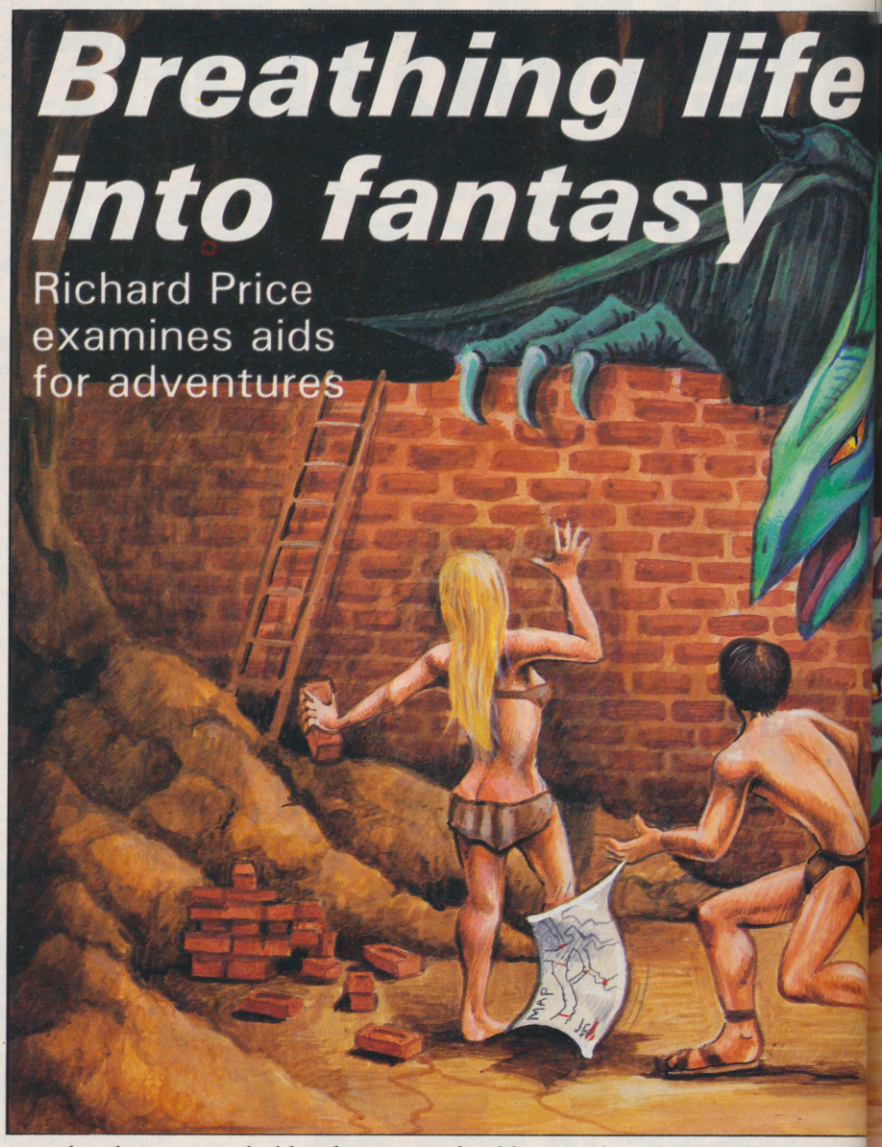
Richard Price examines aids for adventures



AFTER THE LAST goblin has been offed or the top secret plans recovered from some rusty casket in the quicksands, do you sit back with a mild feeling of dissatisfaction and wonder whether you couldn't do just as well yourself?

Even if you can barely manage to program a nested loop in Basic it does not mean you cannot translate your feverish imaginings into electronic reality by creating your own adventure. You could be surprised to find your own game design is at least as exciting as a lot of the average and uninspiring offerings now on the market.

Don't kid yourself, though, that over a weekend you're going to churn out a program that will knock spots off the **The Hobbit.** Whether you write your programs or use tailor-made utilities, design and careful planning will require a great deal of time and paperwork before you even get started on the keyboard. Assuming you have a theme and a convincing setting the first priority will be a location map and its accompanying descriptions.

Drawing the map is a time-consuming process and it is best to use graph paper, leaving plenty of space between each box for notes, messages and so on. Print 'n' Plotter make a handy Adventure Chart with pre-drawn location boxes which should help simplify the task. The size of a large sketch pad has been produced primarily for players, but should be just as useful for games design.

Once a preliminary map is completed you will feel your fantasy world is taking shape. Adding descriptions will help put living flesh on those bare bones and, if the text is inventive, informative and atmospheric it will increase the game's playability enormously. Take a look at the superb Level 9 games to see how detailed text can add to the overall effect.

A word of warning — if you are a complete novice don't attempt a giant scenario with hundreds of locations. It's easier to practise on adventures with few locations and simple plots. Remember, too, that the Spectrum memory is limited and may not be able to cope with your dramatisation of *War and Peace* or the two thousand page *Chronicles of Ganglewoop* you have written in your spare time.

The next step is to work out all the likely interconnections between the locations, listing them meticulously. Objects and treasures — some obvious, some hidden — must be scattered around and you must decide what purpose they will have for the explorer of your world. It is probably that area of design which produces most difficulty as a game will stand or fall on the originality of its problems and puzzles. If they are too tough or obscure players are likely to give up in disgust. If they are too simple there will be little challenge or incentive to continue.

If you realise that a deduction problem will be impossible without help then put cryptic clues in the descriptions or the Help data. Anyone who has played **Mountains of Ket** will remember the magic word 'Polo' which gets you past the wall in 'mint condition'. Touches like that increase a program's attraction. Once again, you must keep track of all puzzles and the objects or conditions needed to solve them.

Next you face the task of developing the game vocabulary. It is essential to provide a variety of synonyms wherever possible. That increases versatility and should mean that players will not constantly see 'I can't do that' or similar reports on screen. It is occasionally useful to include an action which can be achieved only by a particular word combination but there is nothing more aggravating to the adventurer than searching through the entire Oxford English Dictionary for some obscure synonym.

Having created that large interlocking network of places, characters, objects and actions the major problem of getting your creation into the computer then pokes you in the eye. Don't panic. The market is well provided with books and programming utilities to help you. If you have little programming experience it is essential that you do some preparatory reading and practise. Many routines used in adventure are standard and, once learned, can be re-used time and again with new data.

Not all books on adventure programming are as useful as they may claim on

the back cover. One of the simplest and clearest is *Write Your Own Adventure Programs* from Osbourne. Jenny Tyler and Les Howarth have made no assumptions about their readership and write in an uncomplicated style, taking you step by step through the entire process. The book is not Spectrum-specific but includes a section showing all the necessary conversions into Sinclair Basic. ZX-81 owners will find that they also have not been forgotten. Like most other books it takes a model adventure as its base and uses pleasantly daft illustrations to demonstrate the various processes. At £1.99 the paperback is extremely good value and contains as much information as many of the more expensive tomes on the shelves. However, because it is not machine-specific it does not run a section on graphics — as if they mattered anyway.

Spectrum Adventures — Sunshine Books, £5.95 — by Tony Bridge and

continued on page 164

At the sign of THE DANCING OGRE

In a sleazy tavern at the back of beyond adventurers gather to tell tales or swap secrets. Mine host passes on the tips.

This month **The Hobbit** and **Valhalla** dominated the conversation. If you are stuck in The Hobbit Melbourne House has now produced *A Guide to Playing The Hobbit,* £3.95. That will answer many of the usual questions. If you scan your back issues of *Sinclair User* you will find that Quentin Heath wrote a series of articles on the game.

Anoushka Vydra from Okewood Hill, Surrey, is stuck in the goblin's dungeon and would also like to know how to get the Ring. Those are problems which many players have experienced. The first is easily resolved by asking Thorin to open the window. Once he has done that you must get him to carry you through it. You then enter the draughty corridors of the Goblin's lair. Once you are out of the Dungeon it is possible you may find the Ring in the corridors but it is more likely to be at the pool a little further on. If Gollum is there you can either kill him, which will reduce your final score, or attempt to answer his riddles. Beware! Gollum may try to strangle you without bothering with riddles.

Howard Dunn of Barton Staffordshire and Adam Mullery of Abergavenney say they have been stuck in Valhalla for a while now. It seems that many players cannot locate the objects. Never fear, John Rundle, 26 Western Road, Aldershot, Hampshire, claims to have all the answers and a full map. If you send him a stamped addressed envelope he is prepared to give you a fact-sheet.

Just for starters, Ofnir can be found by travelling to the Plain in Midgard. Then you must go north into Krank's hall with help from Boldir. Ofnir can be found in a locked chest in the hall to the north west but you must kill Krank to get there and will need further aid in opening the chest.

Artic's tough adventures always generate discussion. **Espionage Island** is troubling Christian Massey of Eastbourne (Tel. 24996) who cannot get further than the jungle trail. Michael Askew of Hengoed, Glamorgan, suggests that players should travel west from the clearing to the aircraft wreckage and find the dark corner. If you enter 'Touch corner' you will find a string. Pull it and you'll receive a string of beads. When given to a native woman those will earn a knife.

In **Planet of Death** the forcefield is a great obstacle to many players. Apparently it is passable by saying 'Open forcefield' twice into the loudspeaker and then enter 'dance'.

If you have a tale to tell, or are in need of a helping hand, write to the Landlord of the Dancing Ogre c/o Sinclair User, *67 Clerkenwell Road, London EC1R 5BH.*

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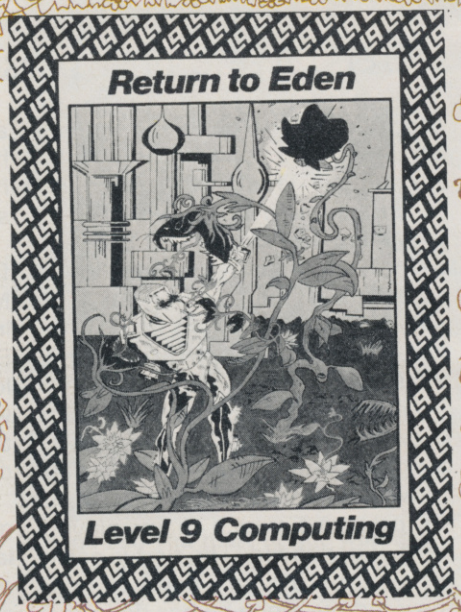
– Acorn User, July 84



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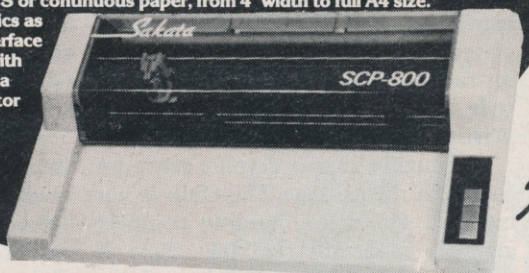

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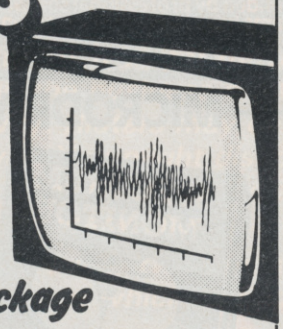

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continued from page 161

Roy Carnell is more sophisticated, more expensive. Like many of the large books it includes a history of the computer adventure whilst the main body of the book concentrates on the creation of a graphic adventure.

It is not to be recommended for beginners but if you want hints on the use of graphics it may prove useful. It contains information on combat sequences, in true Carnell D & D style, and has the full listing of a 48K game.

Adventures do not always stick to the preset location style. Robert Speel's paperback *New Adventure Systems for the Spectrum* — Fontana, £3.95 — gives listings and advice on a number of formats. Speel makes things easier by slicing up the programs into sections, each of which can be added to a foundation program. He tends to gloss over how the routines work and the use of Sinclair printer listings makes reading a bit daunting.

One of the best and most user-friendly guides is Peter Gerrard's *Exploring Adventures on the Spectrum 48K* — Duckworth, £6.95. The three sample programs are pure text games and the author discusses data handling concepts with clarity and some sympathy for those who wriggle in panic when phrases like 'numeric arrays' are bandied about.

As a general guide, beware of books which contain vast listings and precious little else. Those programs take time to type in and will not necessarily teach you much about the structures they use. Always go for books which provide adequate explanations.

If you are not prepared to devote the time required for developing programming skills you will have to obtain a commercial adventure-writing program.

The Quill is now justly famous and can produce machine-coded games of high quality and fast response. At £14.95 cheap it isn't but it offers the embryonic games designer a means of creating complex scenarios quickly and slickly without any programming knowledge at all. The program is menu driven and includes a comprehensive instruction booklet, and though the style is sometimes difficult it is worth persisting until you understand it.

Although a simple graphic set is included in the package The Quill is not intended for games needing complex graphics. You will find that there is room for about 30K of data, enough for lots of locations and fine detail. With imagination you will be able to make commercially viable adventures as others have done already — look at the software ads and you will see.

Dungeon Builder from Dream appears slightly more user-friendly than The Quill. It features a graphics capability using a sketch pad style to draw screens. The functions are manipulated by menus and the location map is shone on screen using a system of interconnecting cells. Regrettably, its available memory is quite limited — around 10K — and that is a disadvantage in creating large adventures.

The Dungeon Master — Crystal Computing — is a different kettle of fish. This game program allows you to create a monster-bashing scenario set in an underground labyrinth. All the hazards, treasures and options are predefined and give little scope for exercising your own imagination. You will not be able to use it to make standard text adventures but you should find it entertaining if you enjoy a bit of hacking and smashing.

It is often said that computer gaming is an essentially passive occupation, stunting the imagination and critical faculties. Anyone who has played adventure will know that to be an unjustified and sweeping generalisation. If you decide to go further and create your own adventures you will certainly extend your imaginative range and logical skills. You might even trawl a little brass on the way.

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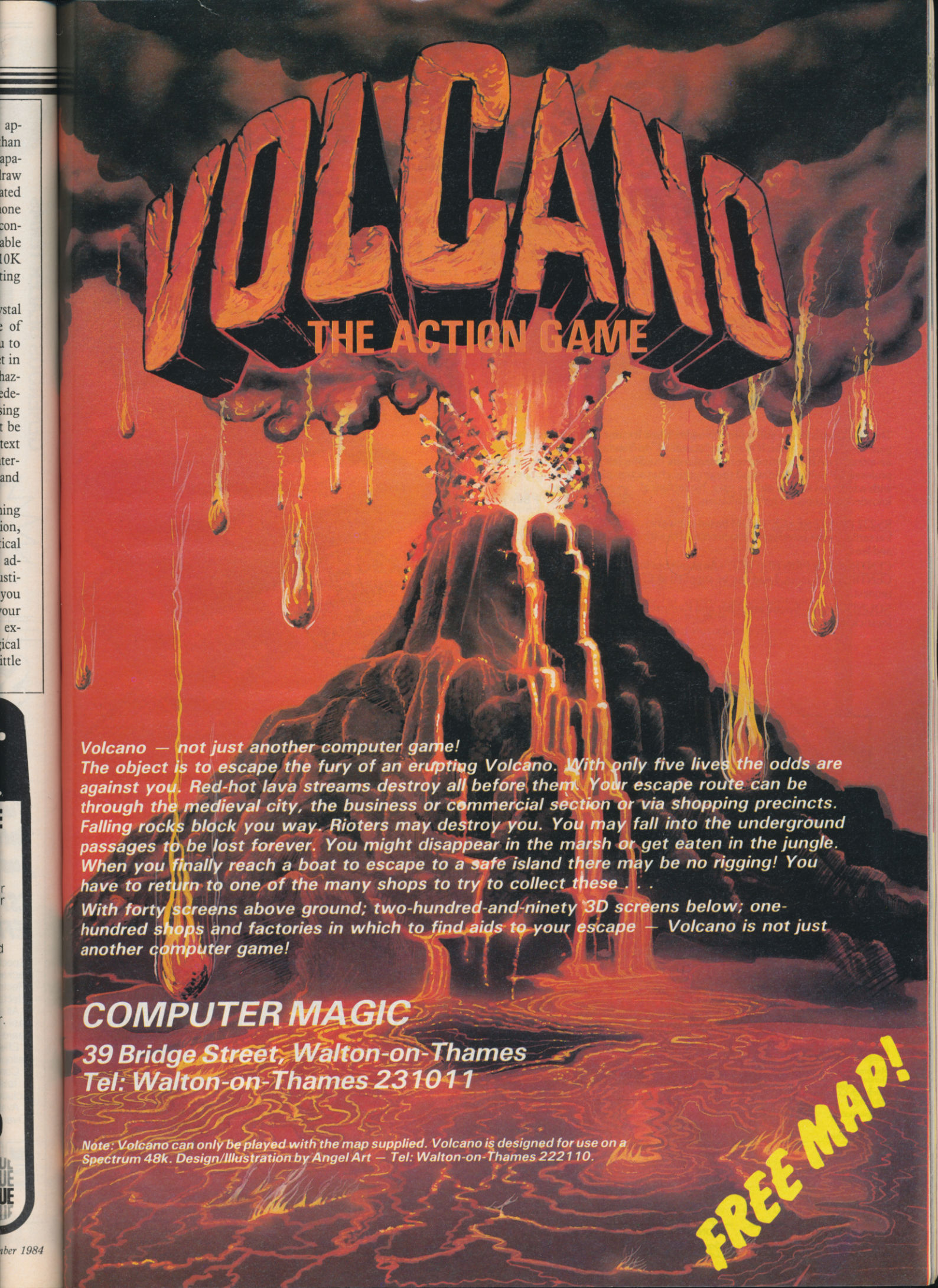
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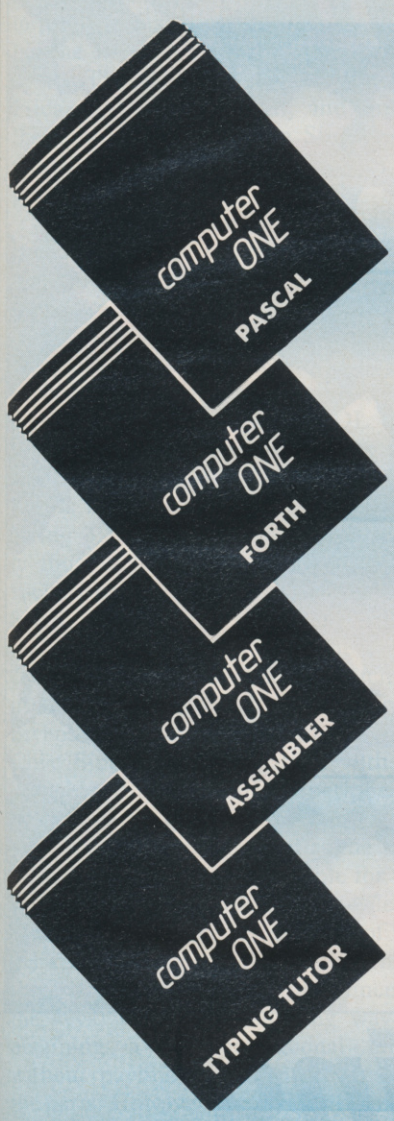

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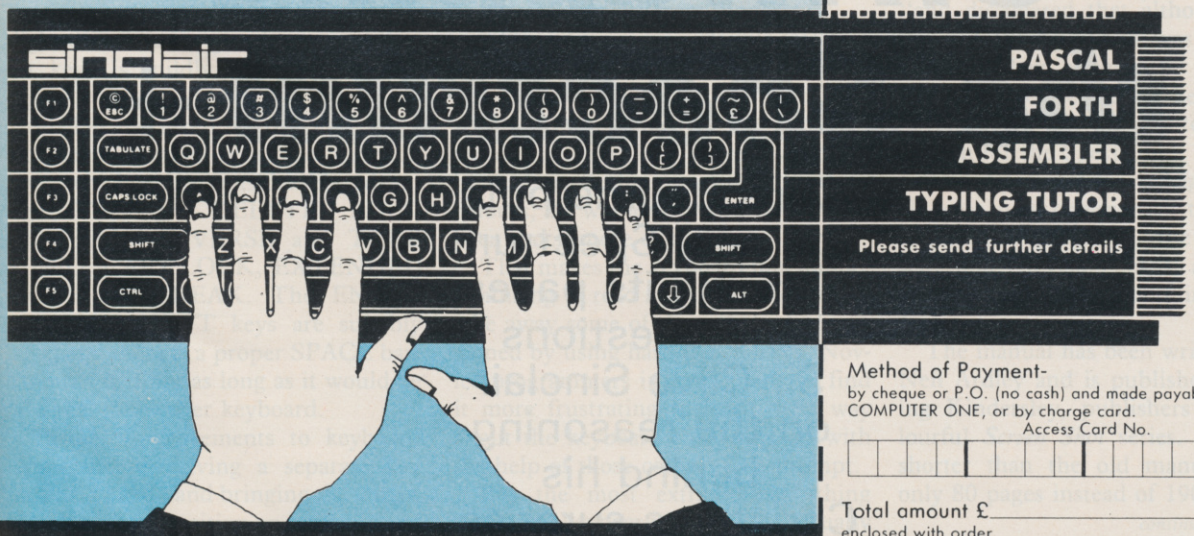

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Unwrapping the Spectrum +

Chris Bourne puts the new Spectrum through its paces and questions Sir Clive Sinclair on the reasoning behind his Christmas surprise.

LOOKING FOR ALL the world like a truncated QL, the new Spectrum burst upon an unsuspecting *Sinclair User* office on Monday 15th October. Well, not quite unsuspecting. There had been rumours for several months that Sinclair was going to put a real keyboard on a Spectrum, but the company has steadfastly denied them. The news was leaked on the Friday before the launch, and finally the tight-lipped men from Sinclair admitted that 'something sexy' was in the post.

Sexy it ain't, although like all Sinclair products there is something good and something less good about it. The Spectrum+, a name which hardly rolls off tongue nor typewriter, is exactly the same old Spectrum 48K with a solid keyboard attached, the whole presented very much in the style of the QL with sharp rather than rounded edges and similar ribbed black plastic.

It is larger than the Spectrum, measuring 320mm×140mm×40mm, nearly four inches longer. The keyboard itself is based directly on the QL keyboard, and utilises a rubber mat below the plastic keys rather than the direct contact between key and switching usually associated with professional keyboards. It should, according to Sir Clive Sinclair, be compatible with all available software, and any peripherals which will fit.

The touch is not as good as the very best keyboards already available for the Spectrum, although it is preferable to some of those at the lower range of the market. Because of the rubber mat, there is a certain amount of bounce in the keys, which is a cunning way of obtaining a semi-professional effect without paying professional prices for the parts. However, the weight required is not as even as it should be and the slight difference in give between different keys is mildly irritating for fast typing.

Sinclair has taken the opportunity to include a number of single function keys, which are a considerable advantage. They are DELETE, EDIT, GRAPHICS, INVERSE and TRUE VIDEO, CAPS LOCK, EXTENDED MODE and BREAK. The ENTER and CAPS SHIFT keys are suitably large, and there is a proper SPACE bar, although it is not as long as it would be on a real typewriter keyboard.

Further improvements to keyboard layout include giving a separate key each to "., and ; and bringing the cursor keys down to a position on both sides of the SPACE bar. The other functions of those keys remain on the top row, as before.

The net effect of the changes is to make it much easier to write programs using graphics and colour control codes, because the several key shifts required on the ordinary Spectrum become easier to follow using single-key entry. The punctuation marks are not such a good idea. It was certainly an improvement to give them their own single-touch keys, but the " and ; are tucked away in the bottom left corner, where nobody who had ever learned to type would think of looking for them.

The keywords and functions are all in white on the keys. Each key has a raised moulding contoured for fingers, and the legends within the moulding give the commands and letters obtained in K, G and L mode. The words outside the moulding are those features obtained in E mode. Unfortunately, Sinclair has abandoned the use of different colours to indicate the different modes.

"The keys are double-injection moulded," says Sir Clive, "which means they can never wear out. The words are not printed but moulded within the keys." Sir Clive says that if he had used that process with three colours, the whole keyboard would have been much more expensive.

That makes the keyboard much more confusing to read and undoubtedly will take away some of the speed advantage gained by using hard plastic keys. Novice programmers in particular will find it more frustrating to learn their way about the keyboard than they do with the help of those colours as a prompt.

But the most extraordinary thing about the keyboard is that it is actually smaller than the original in one important sense. Although the keys are larger than the original rubber pads, those pads were spaced out well, making it easier to hit the correct one and also providing more room for the printed key functions. On the new version the distance between the centre of two keys is fractionally less. The original keyboard was criticised for being small and cluttered, and in that respect the new one is no improvement.

The only other hardware change to the machine is the inclusion of a reset button on the left hand side of the plastic casing. That is a feature which should have been included on the original, and it is a relief to see Sinclair recognising the problems of wear and tear on the power socket at last. There is still no ON-OFF switch, however.

According to Sir Clive, the main target is customers thinking of buying the Commodore 64. "We did some market research last year," he says, "and discovered that although people thought the Spectrum was a superior machine they bought the 64 for the keyboard." Once the QL keyboard was developed, it was decided to produce a version for the Spectrum.

The Spectrum+ package also includes a new power pack to style, six commercial programs, the usual cassette and television leads, and a completely new manual and introductory cassette.

The manual has been written by one Neil Ardley and is published by Dorling Kindersley, publishers of the colourful *Screen Shot* series. It is much shorter than the old manual, having only 80 pages instead of 190.

continued on page 172

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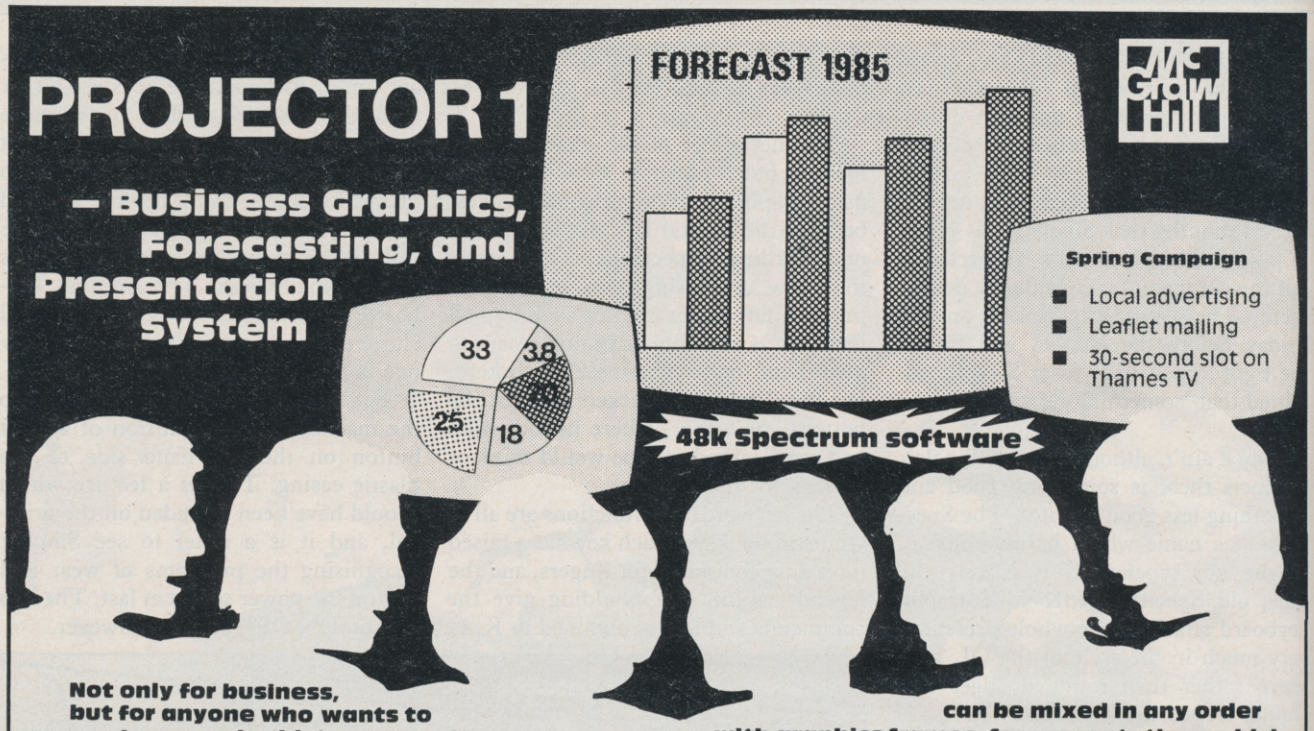

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Spectrum +

continued from page 169

It is written in four sections with colour-coded margins. The first is Get Going, and provides a coherent guide to plugging the machine in without blowing it, yourself, or the Christmas turkey up. There are diagrams of pink fingers pushing the correct buttons, photographs of what the screen should look like, and a flow chart for discovering the source of the problem. Following that there are some examples of short programs which produce pretty patterns to impress admiring friends and relations.

The second section deals with programming, and is much less comprehensive than the original manual. The section concentrates almost exclusively on graphics, with a short section at the end on sound. Concepts such as LET, FOR . . . NEXT loops and logical operations such as IF . . . THEN structures are mentioned almost in passing as the budding programmer is whisked through to the heady heights of assembling a program in which a spider descends to some pyramids while being shot at by a laser gun. Topics such as animation, attributes and user-defined graphics are explained, but it is not so much a guide to programming as an example of how to put a program together.

The third section is a brief explanation of the mechanics of the machine and the familiar diagrams of CPU, RAM chips and the like all connected by neat lines along which the information flows smoothly and in perfect discipline. It includes a memory map but no details of the system variables.

The final section gives a list of all the Basic commands and an explanation of how each one works. Brief examples are given, but even in combination with Section Two it falls way short of the uninspired but comprehensive guide provided by the original manual.

While the User Guide is a beautifully produced book with plenty of photographs and illustrations, its limitations are confusing. It seems aimed rather more towards a younger, games-orientated market, and does not, lamentably, provide a sufficiently organised course in programming to encourage newcomers to write anything very satisying for themselves.

Dorling Kindersley intends to market the Guide separately for £4.95, which seems a bit steep considering that Spectrum owners will already have a copy of the old manual. If you are still puzzled by the Spectrum graphics instructions, you might be enlightened by the Guide, but there are plenty of other books available in the same price range on the subject which contains much more information besides those simple points covered in both manual and guide.

It is thus unclear as to who would really want the Spectrum+. Those who are only interested in playing games will find the rubber keyboard as easy to use as the plastic one, and a joystick easier than both. Indeed, many of the standard interfaces, including the Kempston joystick and Centronics interfaces, will not fit the new machine, because their ports are obscured by the new casing.

On the other hand, those with serious applications, be they professional or home uses, will probably obtain better value for money buying a 48K rubber key Spectrum and one of the commercially available keyboards. For the £50.00 price difference you can choose from a wide range of keyboards, many of which are much more professional than the Sinclair one. If they can obtain a Spectrum with the Six-pack offer they will get almost the same software as is offered with the Spectrum+ as well. Once the Six-pack offer is discontinued it becomes a much more attractive proposition.

It is therefore worth considering the Spectrum+ not as a £180 computer but as a £50.00 keyboard. Single-key entry commands are not available on any commercial keyboard for the price, but for £10.00 more you could have a Stonechip, which also includes a BEEP amplifier and Load/Save switch. Further up the scale, at about £70.00, the Transform keyboard will give you a more professional feel as well as a numeric keypad and an on/off switch.

On a more comparable price level the Lo>> Profile and Saga keyboards offer well spaced keys with good touch but no single-entry keys. They make up for that deficiency by including several duplicate keys so that one or other of the SHIFT keys is always close at hand.

Sir Clive is convinced that the Spectrum+ will increase his lead over the Commodore 64 in Britain, and make inroads on Commodore domination of the world market. "We feel that there are more serious users about, and that is reflected in the current software available," he says. "It could cut into sales of the QL, but then we are offering people a choice."

First time buyers should consider whether one of the other commercial keyboards would not be more suitable for their use. If you are looking for a word-processor you would probably put ease of typing at a premium and might prefer a keyboard such as the Transform, Saga or Lo>> Profile. But for programmers the Sinclair keyboard offers much greater flexibility of single-entry commands which will cut out some of the drudgery of programming, particularly where graphics are concerned.

Certainly no-one in their right mind is going to buy the Spectrum+ if they already own a Spectrum. Sir Clive may have done the decent thing by typists' fingers at long last but there are limits.

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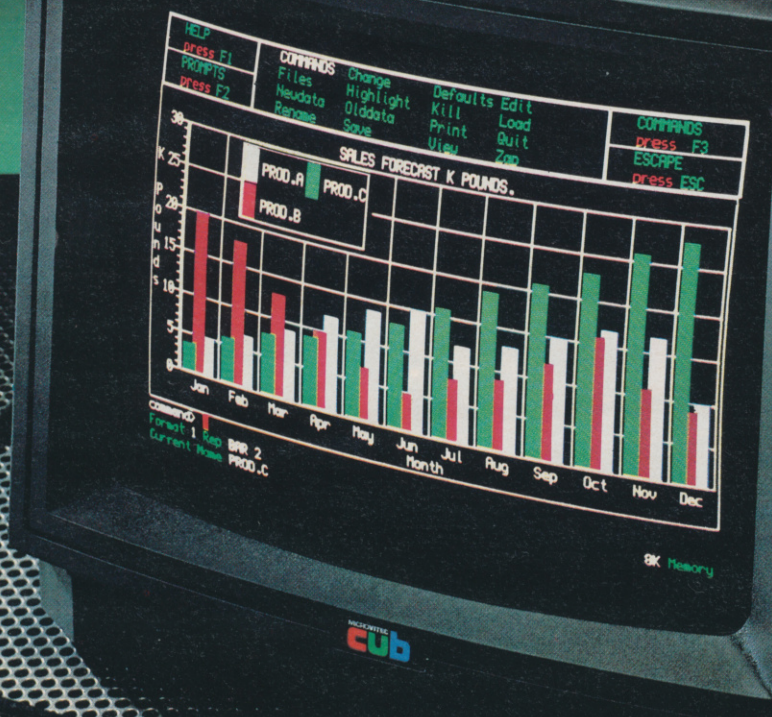

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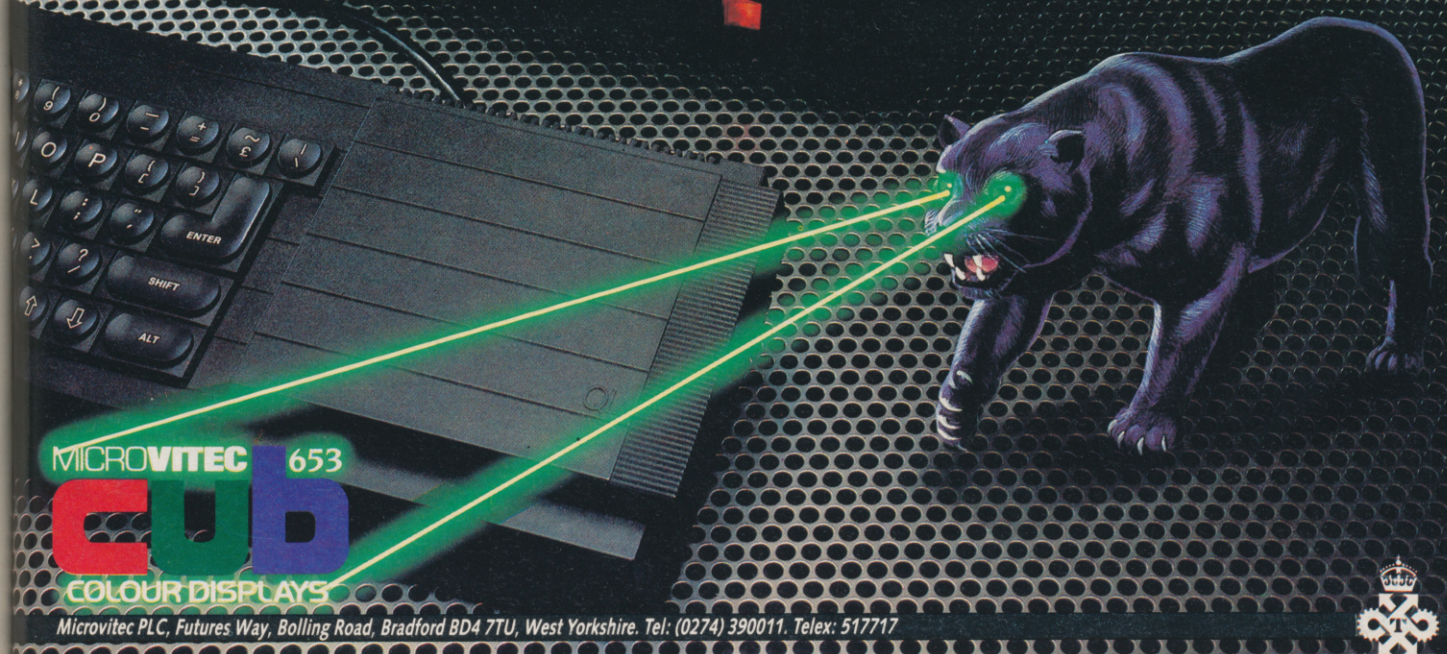

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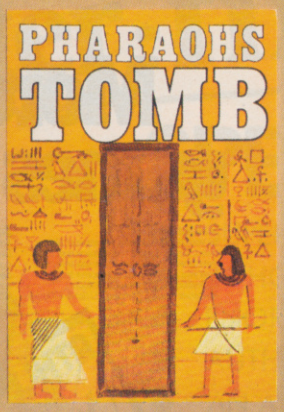

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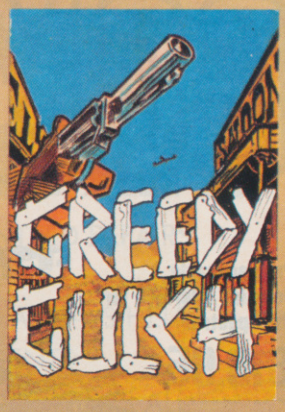

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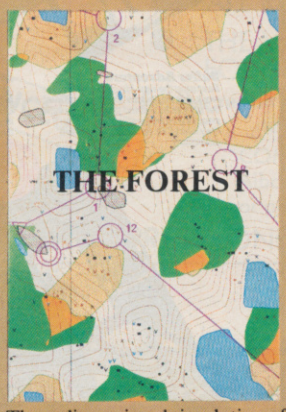

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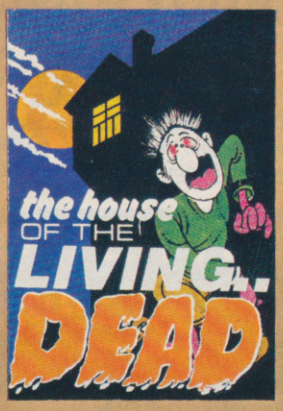

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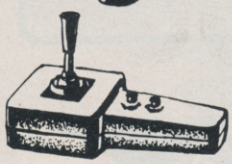

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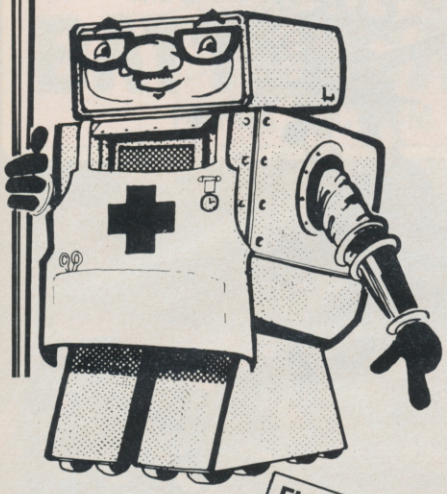

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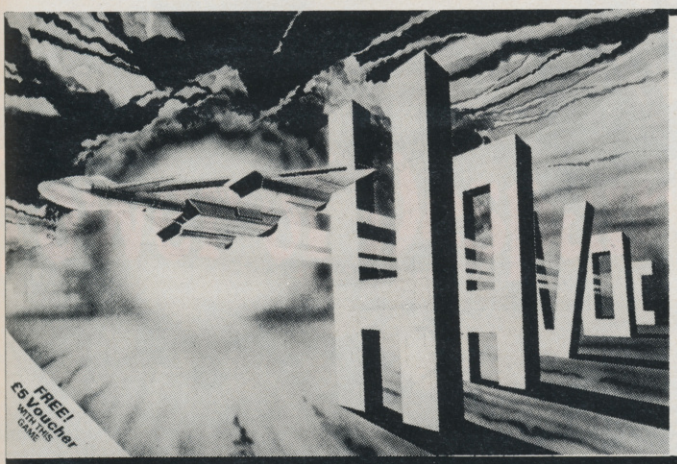

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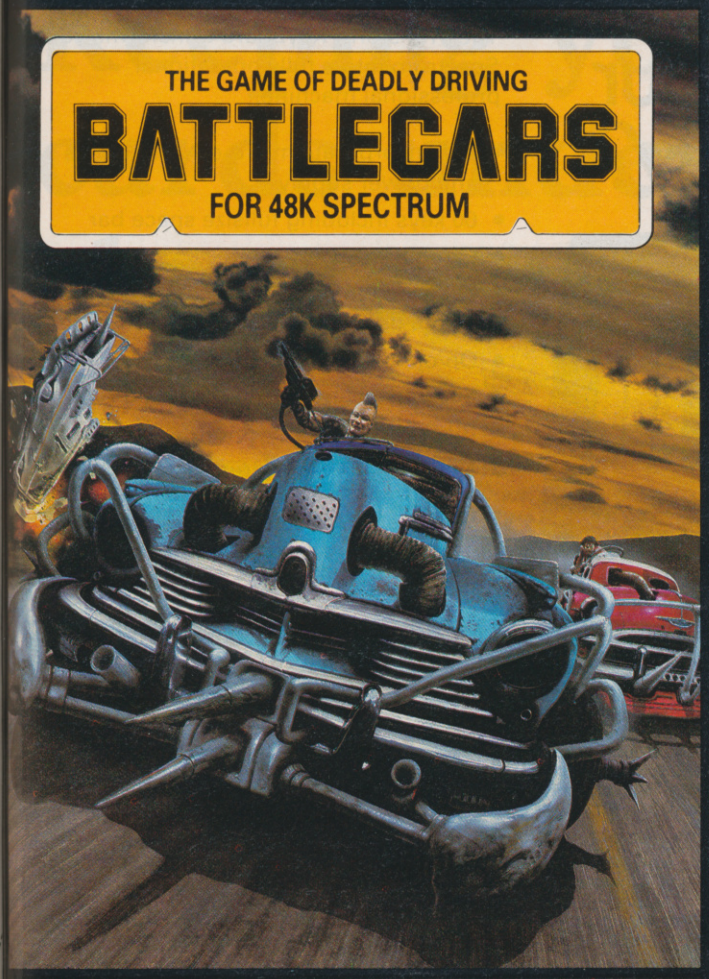

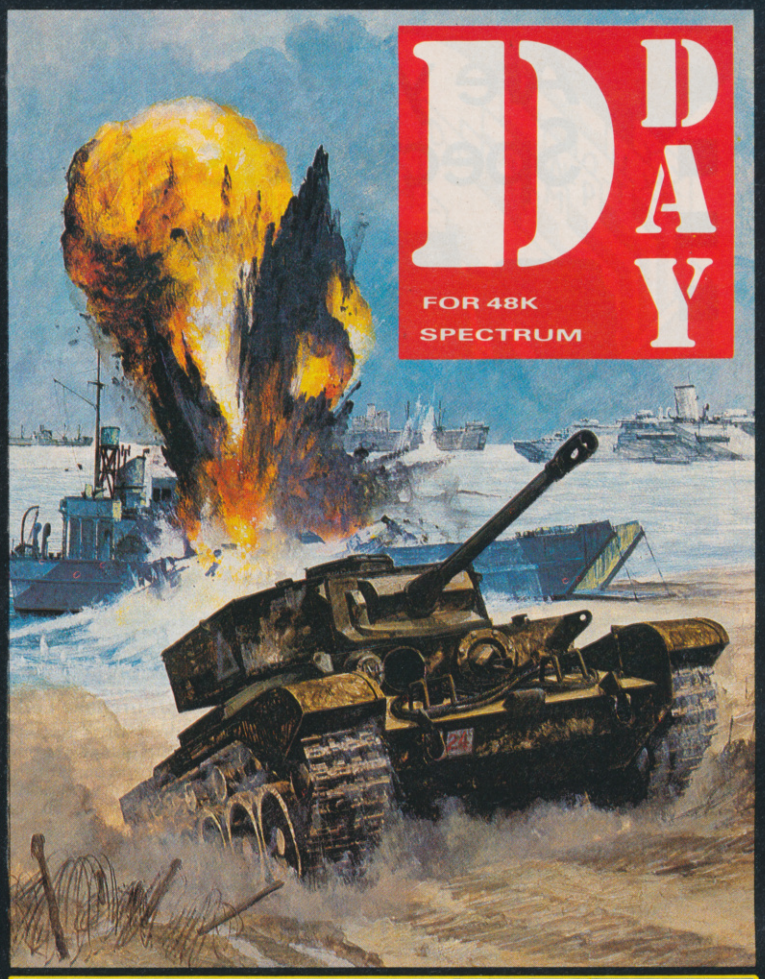

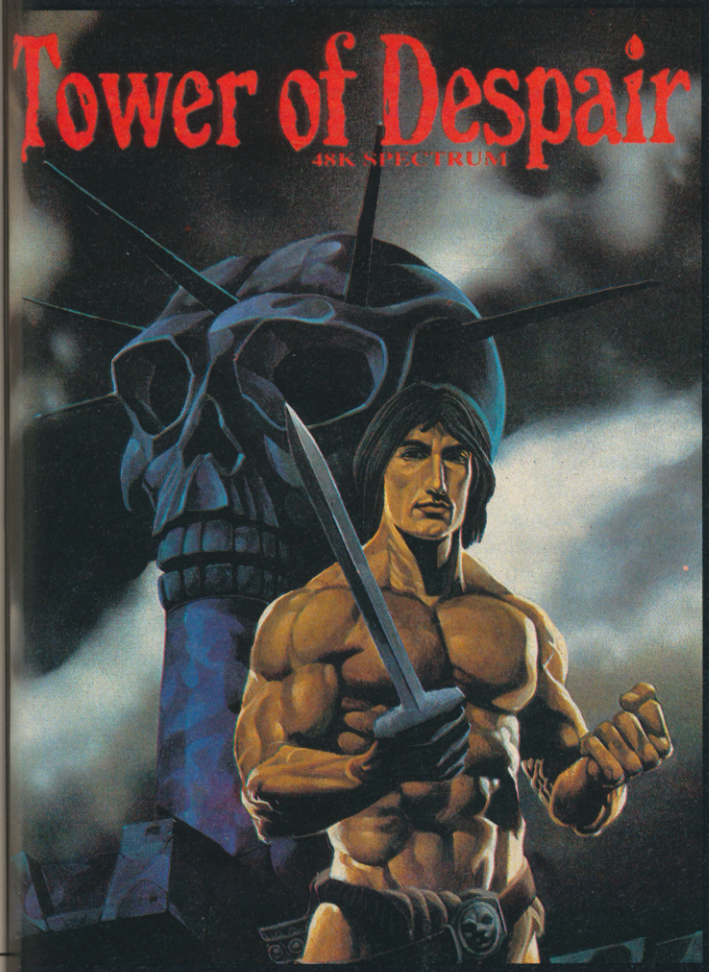

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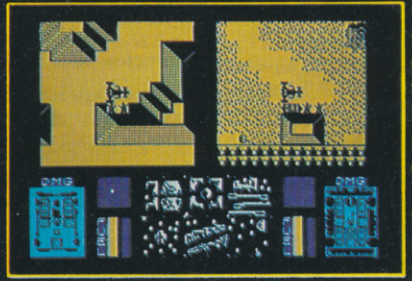

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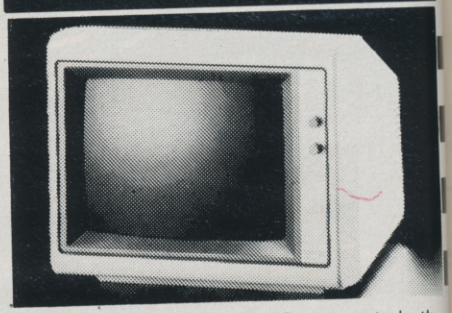

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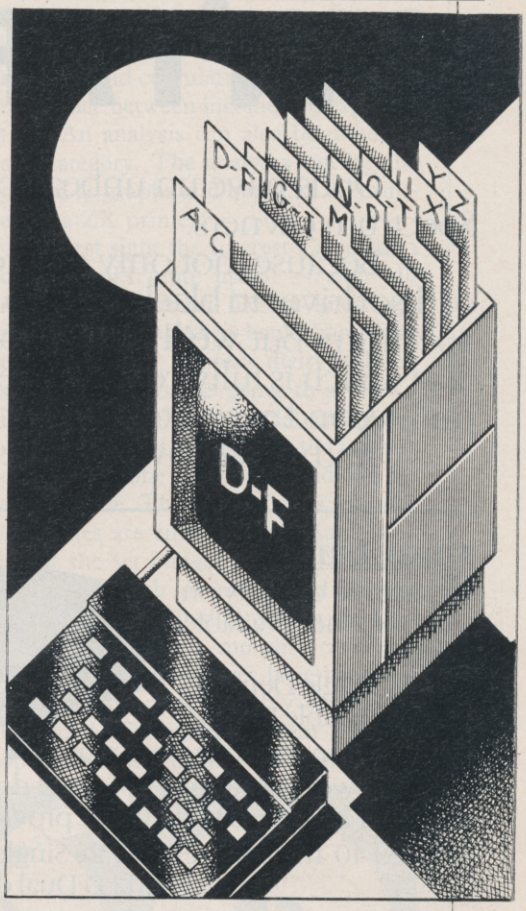

DATABASES vary in complexity from the simple card index type to the full relational database. **Keyfile** from Keysoft is of the card index type for the 48K Spectrum. The program is compatible with microdrive and the first option on loading from cassette is to save the program to microdrive.

Each record (a set of data on a subject) consists of one screen (the card) which can contain up to 40 different fields (individual pieces of information). At the start the layout of the screen must be established using option 1. That is done by setting the colour of the card and the ink used first. Text can then be entered at any point on the screen. The cursor keys are used to position the cursor prior to entering the text and the delete key — CAPS SHIFT and 0 — is used to correct any mistakes. Moving a piece of text involves deleting the original and then retyping at the new position. When you are satisfied with the layout pressing ENTER confirms and it is then impossible to use a different screen layout without reloading the program.

Once the card layout is ready the next step is to mark where the data will start for each field. You do that by using the ENTER key to mark the start of a field and E to return to the main menu when all the fields have been marked. The on screen instructions are unclear and you might find yourself back at the main menu having marked one field. If that happens it is impossible to further edit the layout. If a mistake has been made the whole program must be reloaded.

Once the card layout is satisfactory the data for individual records can be entered using option 3. The program prompts for each field in the order in which the starting points were fixed. The prompting makes entering data very easy. There are two restrictions on the data used. A field will only extend for one line — a maximum of 32 characters — and the first field entered must be unique as it is used as a reference for the record.

The file can be searched to find and display any record, although a search can only be done on the first field of your records. If you cannot remember the contents of the first field you can use the index option to list all the first fields or you can specify only those beginning with a particular character. You are given the choice of sending the list to the screen or to a ZX-type printer. The search is very fast and it takes virtually no time at all to produce the index, even for large files, although the names are listed in the order in which they were entered. Keyfile also distinguishes between capital and lower case letters.

Once your records have been stored it is almost certain that you will want to amend or delete one of them. That is easy, provided that amending a record does not involve having to use a different screen layout. Before a record can be amended or deleted it must be found by a search on the first fields. A prompt for the contents to be sought is given and when entered the record seems to appear in no time at all. If no record exists then you are informed by a loud beep and a flashing message. You are then prompted to either amend or delete the record. Deleting the record requires confirmation before it is deleted while amending the record prompts for each field in turn. Old entries are kept the same by pressing ENTER and amendments made by typing in the new field.

A search and copy option is also included in the main menu. That works in the same way as the search from the amend/delete option. After the record has been displayed on the screen you are given an opportunity to print it out before searching for another one or returning to the main menu.

Finally, you can load and save your records file to microdrive or tape or end the program. Both the saving and loading options ask for the filename first and then ask for a number from one to eight for a microdrive or "T" if you are using tape. Ending the program carries out a NEW command and returns to Basic.

The program will hold about 33,000 characters at one go. To help you plan how many more records you can enter a count of the number of bytes available is shown at the top of the main menu.

Your first impression of Keyfile is likely to be one of disappointment, although it appears easy to use. The problem lies only partly in the program. Getting the record layout correct, the positioning of the text and start of fields, is the difficult part. Your inability to return and amend the layout becomes a constant source of irritation, especially as the program has to be reloaded each time. However, once past that stage, Keyfile is simplicity itself to use. The speed of the machine code search is impressive as is the high degree of protection from silly responses to prompts. This is certainly a card file program to consider buying, but it is a pity that setting the layout was not more flexible.

Mike Wright

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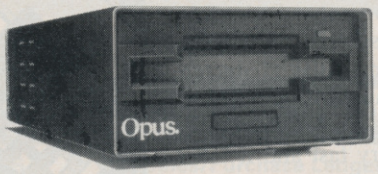

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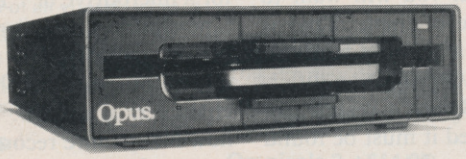

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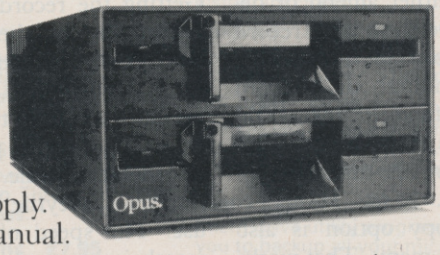

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Money-go-round

MONEY MANAGER from Creative Sparks is designed to help you plan your household budget. The program, which is not microdrive compatible, runs on the 48K Spectrum and is packaged in a plastic wallet. The manual is finely printed on a single strip of paper.

While the instructions are clear and concise I found them difficult to read because they are underprinted with the words Money Manager in a variety of green and blue inks. The most useful option of all, that of analysis, warrants only a passing mention while every other option is described more fully.

The program is menu-driven and although there is very little single-key entry, to select options a prompt line and flashing cursor are used to indicate that an entry is expected.

Money Manager allows you to define up to 50 categories of income and expenditure and to set monthly targets for each one over a twelve month period. On first loading the program you are asked to enter a filename, of up to 10 characters, for the data. That is used as the program name when the program and data are saved. It is also displayed when a version of the program that has been previously saved is loaded. When the filename has been entered the Main menu is displayed. That enables you to start a new financial year and set the opening balance, name the categories and assign budgets to them, and set the amount you actually spent or received in a month. Two other options allow you to compare aspects of your spending — or income — against the budgets and to calculate the approximate interest paid or received in a year. The standard option of 'save' is included but there is no 'load' option. Saving the data also saves the program so that by loading a saved version of the program the data is automatically loaded.

Selecting the near year option allows you to define the first month of your financial year, clear the actual and budget values (clear all) or clear the actual values and keep the budget values (carry forward). Selection of the clear options must be confirmed before the values are cleared.

Defining the categories and setting the budgets is easily done in option 2. Adding a category involves giving it a number between one and 50, a name of up to 12 characters, defining it as an income (i), or expenditure (e) category and assigning a letter as a class identifier. The class seems to have no practical use other than being necessary for the interest categories. It is not possible to analyse by class although that would seem to be a necessity and would make the program far more powerful.

Choosing to set a budget displays a list of months with the actual, budget and differences. One of the months is highlighted to show the budget which is to be set. Alternatively the same budget figure can be set for all months at once. Other options allow categories to be deleted, names to be changed and, if more than 21 categories are used, to display the next page of categories.

Any attempt to add a category number which already exists is ignored. However, a bug in the program causes any valid category number used after that to be rejected as well. It seems the only way out of that loop is to enter 'n' or 'x' to exit the main menu. When a category is deleted the actual and budget values are not. Consequently setting a new category using the old number has the same effect as changing the category name. That is a fault in the program but as new values have to be entered anyway it is hardly a major one.

Setting the actual values is done in the same way as the budgets without being able to set all values at once. That option is also used to change the actual values should you need to. All amounts are entered as whole pounds and minus signs are not used to denote expenditure as in some programs.

The analysis section is used to look at the differences — either absolute or percentage — between the budget and actual values in seven ways. Those include monthly income and expenditure, total income and expenditure, as well as monthly and cumulative cashflow — the difference between income and expenditure. An analysis can also be done for any category. The analyses can be displayed as graphs and both can be printed to a ZX printer.

At first sight the Interest Calculation option looks quite useful — after all, most people would like to know approximately what their bank charges are or how much interest their building society accounts are going to give. To use the option two special categories must be added before doing the interest calculation, one for income and one for expenditure. The interest rates for both categories are entered in the same way as for the set budget option. A budget figure for both overdraft and deposit interest is calculated by taking the simple interest on the monthly cashflow. Once the budget figures have been calculated the actual monthly values can be added. The main problem with the option is that it assumes all your excess money at the end of a month will earn interest and will therefore give a greater figure than can reasonably be expected.

A major disadvantage of programs of this type is that of adding individual transactions to obtain the actual monthly values for each category. Overall, however, Money Manager is easy to use and the screen displays are clear and uncomplicated. The error trapping is very good and although there are a couple of bugs in it they will not corrupt your data.

Mike Wright

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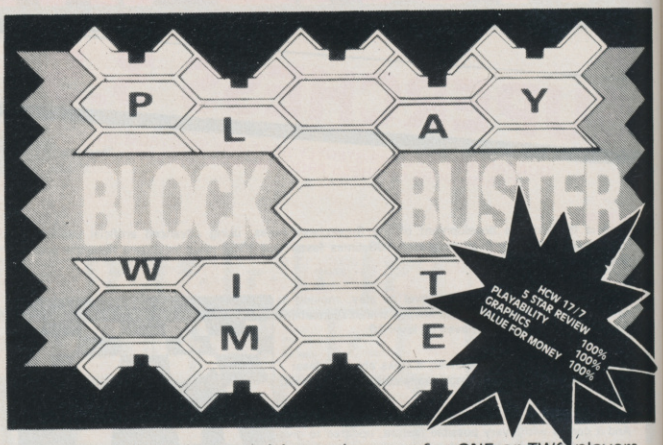

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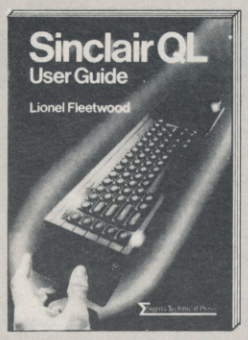

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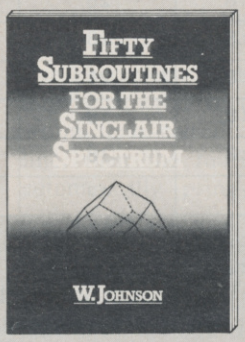

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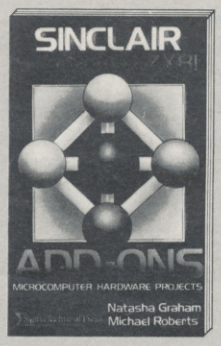

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Most displays are 64 characters wide.
Jon Ellis squeezes more into the Spectrum screen.

ZX Condenser

ONE OF THE MANY annoying features of the Spectrum is the screen layout, 24 lines each of 32 characters, of which only 22 lines are usually available to the user. Many computers have the facility to put the more standard 40 characters — (or even 80 characters) — on a line. This utility alters the pitch of the Spectrum printing to give nine different character per line ratios. The routine also enables you to position text on the screen and to give it colour.

Although non-standard, 32 characters per line is a logical development from the way in which Sinclair designed the Spectrum screen. As you will know from user-definable graphics, a character on the Spectrum can be represented by a eight by eight grid of pixels. Since there are 256 pixels in the x direction, we may fit 256 divided by eight, or 32, of those pixel grids across the screen. What this utility does is to alter the size of the pixel grid used to represent a character.

If we decide that a character is to be made up of a six by eight pixel grid, then we will be able to fit 256 divided by six, or 42, characters per line, taking the integer part of the division only. Table 1 shows the effect of letting the size of the pixel grid range from six by eight to 15 by eight. Note that we are only altering the size of the grid which defines a character, not the size of the shape within the grid — i.e. what is being printed.

Table 1.

Size of grid	Characters per line	Value of F
6×8	42	6
7×8	36	7
8×8	32	8
9×8	28	9
10×8	25	10
11×8	23	11
12×8	21	12
13×8	19	13
14×8	18	14
15×8	17	15

It is easy to print characters in grids larger than eight by eight — all that needs to be done is to print each character of the text as normal, but inserting a gap of several pixels between successive characters. However, it is slightly more difficult to condense print from the standard print. How do we make the grid smaller? The answer to that can be found by looking at the design of the standard Sinclair character set.

Taking a non-graphic character such as the letter 'm', as in Figure 1, we see it has a border of blank pixels completely around the letter shape. What the program does is to clip off the left and right hand edges for the six by eight grid, or just the right hand edge for the seven by eight grid. The routine prints the first character of the text, and then moves along six, or seven, pixels before printing the second character; that procedure is followed for all the other characters in the text string.

Type in Listing 1 if you have an assembler. If a 16K version is required replace line 50 with
00050 ORG 32080
If you do not have an assembler, then type in either Listing 3 or Listing 4 as applicable.

Once you have finished typing, save the source program, and then create the object code (either by using the assembler, or by running the basic), which should then be saved by entering
SAVE "MULTIPITCH" CODE 32080,515 (16K)
or
SAVE "MULTIPITCH" CODE

```
10794 ********************
00020 ;**  CHARACTERS  48k
00030 ;** by Jon Ellis 1984
00040 ;********************
00050 ORG 64810
00060 FINDX LD IX,VARSC
00070       LD (IX+0),120
00080       CALL SCAN
00090       INC HL
00100       INC HL
00110       INC HL
00120       LD A,(HL)
00130       LD (XCOOR),A
00140 FINDY LD (IX+0),121
00150       CALL SCAN
00160       INC HL
00170       INC HL
00180       INC HL
00190       LD A,(HL)
00200       LD (YCOOR),A
00210 FINDF LD (IX+0),102
00220       CALL SCAN
00230       INC HL
00240       INC HL
00250       INC HL
00260       LD A,(HL)
00270       CP 6
00280       JR NC,INRNG
00290 ERR1  RST 8
00300       DEFB 25
00310 INRNG CP 16
00320       JR NC,ERR1
00330       LD (FONT),A
00340 FINDS LD (IX+0),83
00350       CALL SCAN
00360       INC HL
00370       LD E,(HL)
00380       INC HL
00390       LD D,(HL)
00400       INC HL
00410       JR INIT
00420 SCAN  LD HL,(23627)
00430 LOOP7 LD A,(HL)
00440       AND 224
00450       CP 96
00460       JR Z,TYPE1
00470       CP 160
00480       JR Z,TYPE2
00490       CP 128
00500       JR Z,TYPE3
00510       CP 224
00520       JR Z,TYPE4
00530       CP 64
00540       JR Z,TYPE5
00550       CP 192
00560       JR Z,TYPE3
00570 ERROR RST 8
00580       DEFB 1
00590 TYPE1 LD A,(HL)
00600       CP (IX+0)
00610       RET Z
00620       LD DE,6
00630       JR ADDA
00640 TYPE2 INC HL
00650       BIT 7,(HL)
00660       JR Z,TYPE2
00670       LD DE,6
00680       JR ADDA
00690 TYPE3 INC HL
00700       LD E,(HL)
00710       INC HL
00720       LD D,(HL)
00730       INC DE
00740       JR ADDA
00750 TYPE4 LD DE,19
00760       JR ADDA
00770 TYPE5 LD A,(HL)
00780       CP (IX+0)
00790       RET Z
00800       JR TYPE3
00810 ADDA  ADD HL,DE
00820       JR LOOP7
00830 INIT  PUSH HL
00840       PUSH DE
00850       LD A,(FONT)
00860       LD HL,256
00870       LD E,A
00880       LD D,0
00890       LD B,D
00900 LOOP5 INC B
00910       AND A
00920       SBC HL,DE
00930       JR NC,LOOP5
00940       DEC B
00950       LD HL,0
00960 LOOP6 ADD HL,DE
00970       DJNZ LOOP6
00980       DEC HL
00990       LD (MAX),HL
01000       POP DE
01010       POP HL
01020 START LD A,(HL)
01030       LD (CHAR),A
01040       PUSH HL
01050       PUSH DE
01060       CALL CHRS
01070       LD A,(FONT)
01080       CP 8
01090       JR NZ,STRT1
01100       LD A,(XCOOR)
01110       CP 241
01120       JR NC,ENDLN
01130       ADD A,8
01140       LD (XCOOR),A
01150       JR NXTCH
01160 STRT1 LD A,(XCOOR)
01170       LD L,A
01180       LD H,0
01190       LD A,(FONT)
01200       LD E,A
01210       LD D,H
01220       ADD HL,DE
01230       LD A,L
01240       LD (XCOOR),A
01250       LD DE,(MAX)
01260       AND A
01270       SBC HL,DE
01280       JR C,NXTCH
01290 ENDLN XOR A
01300       LD (XCOOR),A
01310       LD A,(YCOOR)
01320       SUB 8
01330       LD (YCOOR),A
01340       JR NC,NXTCH
01350       ADD A,8
01360       LD (YCOOR),A
01370       RES 0,(IY+2)
01380       CALL 3282
01390 NXTCH POP DE
01400       POP HL
01410       INC HL
01420       DEC DE
01430       LD A,E
01440       OR D
01450       JR NZ,START
01460       RET
01470 CHRS  LD A,(CHAR)
01480       CP 32
01490       JR NC,CHR1
01500       RST 16
01510       RET
01520 CHR1  CP 165
```

Listing 1.

64810,515 (48K)

Both the source program and the object code should be VERIFYed and the computer NEWed. Now type in Listing 2 — the demonstration program. Note that the program is written for the 48K machine; if you are using the 16K version then all the lines containing RANDOMIZE USR 64810 should be replaced with RANDOMIZE USR 32080.

A brief explanation of the assembly language listing, stage by stage follows.

FINDX: Routine which uses SCAN to find the value of the variable x, providing that it can be found in small integer form.

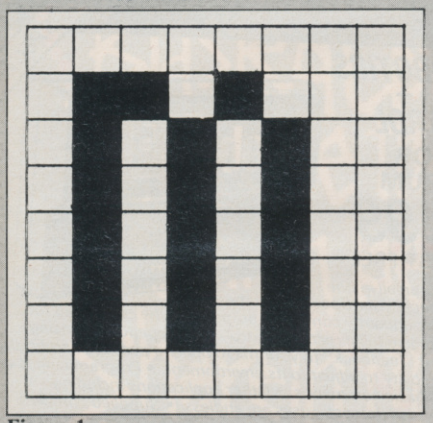

Figure 1.

FINDY: Finds the value of small integer y.

FINDF: Finds the value of small integer f, giving the report 'Q Parameter error' if the value is outside the range 6 to 15.

FINDS: Finds the start address and length of the text string S$.

SCAN: Subroutine which searches the variable area for the variable specified in VARSC. If the variable specified is not found then the report '2 Variable not found' is given. Note that the routine distinguishes between, for example, x as the control variable of a FOR-NEXT loop, and x as a simple numeric variable.

INIT: This calculates the maximum number of pixel grids on a line (the number of pixels in the grid in the x direction is defined by the simple numeric variable f).

START: This takes the characters from the string S$ sequentially and prints them, such that the specified number of pixels occur between successive characters. If there are more characters in the text string than can fit on the line, then the routine will automatically print to the end of that line and then carry on printing on a line eight pixels down. The routine ensures that a character may never straddle a line. If the message was begun on line 0 (the bottom of the screen) and has to be continued on the next line, or indeed, if any message runs out of space on the screen, the routine will automatically scroll the screen up eight pixel lines with no 'scroll?' prompt.

```
  50 LET S$="Trial message"
  60 LET X=10
  70 FOR G=160 TO 16 STEP -16
  80 LET F=INT ((G-16)/16+6)
  90 LET Y=G: PRINT AT 31-2*F,27
;"F=";F
 100 RANDOMIZE USR 32080
 110 NEXT G
 120 LET S$="PRESS ANY KEY TO CO
NTINUE"
 130 LET X=0: LET Y=0
 140 LET F=7
 150 RANDOMIZE USR 64810
 170 PAUSE 0: BEEP .8,30
 180 CLS
 190 LET S$="As an indication of
 the power ofthe utility, look a
t this text. See how much space
 it takes up  in normal printing
 (F=8),32 chrsper line"
 200 LET Y=167: LET X=0: LET F=8
 210 PRINT ;: RANDOMIZE USR 6481
0
 220 PRINT AT 6,0; PAPER 6;"Stri
ng length:";LEN S$;" characters"
 230 LET Y=88: LET F=6
 240 LET S$="And now look at thi
s message, printed withF=6 ( 42
characters per line ). Although
 this string is longer, much les
s screen  space is used."
 250 PRINT ;
 260 RANDOMIZE USR 64810
 270 PRINT AT 15,0; PAPER 6;"Str
ing length:";LEN S$;" characters
"
```

Listing 2.

CHRS: The first part of this subroutine finds out which kind of character is to be printed: control characters, those with codes less than 32, are

continued on page 196

```
01530         RET NC
01540         CP 144
01550         JR NC,UDGS
01560         CP 128
01570         JR NC,BLOCK
01580 NORML   SUB 32
01590         LD DE,(CHARS)
01600         INC D
01610 MULT    LD L,A
01620         LD H,0
01630         ADD HL,HL
01640         ADD HL,HL
01650         ADD HL,HL
01660         ADD HL,DE
01670         LD DE,WORKS
01680         LD BC,8
01690         LDIR
01700         JR WHERE
01710 UDGS    SUB 144
01720         LD DE,(UDG)
01730         JR MULT
01740 BLOCK   LD E,0
01750         SUB 128
01760         CP 8
01770         JR C,BLOK1
01780         LD B,A
01790         LD A,15
01800         SUB B
01810         LD E,255
01820 BLOK1   LD D,A
01830         LD B,2
01840         LD HL,WORKS
01850 LOOP1   PUSH BC
01860         XOR A
01870         RR D
01880         JR NC,SHIFT
01890         OR 240
01900 SHIFT   SRL A
01910         SRL A
01920         SRL A
01930         SRL A
01940         RR D
01950         JR NC,BLOK2
01960         OR 240
01970 BLOK2   BIT 7,E
01980         JR Z,BLOK3
01990         AND A
02000         CPL
02010 BLOK3   LD B,4
02020 LOOP2   LD (HL),A
02030         INC HL
02040         DJNZ LOOP2
02050         POP BC
02060         DJNZ LOOP1
02070 WHERE   LD A,(XCOOR)
02080         LD C,0
02090 LOOP3   INC C
02100         SUB 8
02110         JR NC,LOOP3
02120         DEC C
02130         ADD A,8
02140         LD (REMAN),A
02150         LD A,C
02160         LD (WHOLE),A
02170 PRINT   LD B,8
02180         LD DE,WORKS
02190 LOOP4   LD A,(YCOOR)
02200         ADD A,B
02210         LD L,A
02220         LD A,176
02230         SUB L
02240         JR C,BACK
02250         PUSH BC
02260         LD B,A
02270         LD A,(WHOLE)
02280         LD C,A
02290         PUSH DE
02300         CALL ADDR
02310         PUSH HL
02320         CALL 3035
02330         POP HL
02340         PUSH HL
02350         LD A,(REMAN)
02360         INC HL
02370         CP 0
02380         CALL NZ,3035
02390         POP HL
02400         POP DE
02410         LD C,0
02420         LD A,(REMAN)
02430         CP C
02440         LD B,A
02450         LD A,(DE)
02460         JR Z,EXACT
02470 FRACT   SRL A
02480         RR C
02490         DJNZ FRACT
02500 EXACT   XOR (HL)
02510         LD (HL),A
02520         INC HL
02530         LD A,C
02540         XOR (HL)
02550         LD (HL),A
02560         POP BC
02570 BACK    INC DE
02580         DJNZ LOOP4
02590         RET
02600 ADDR    LD A,B
02610         AND 248
02620         RRA
02630         RRA
02640         RRA
02650         LD D,A
02660         AND 24
02670         ADD A,64
02680         LD H,A
02690         LD A,D
02700         AND 7
02710         RRCA
02720         RRCA
02730         RRCA
02740         ADD A,C
02750         LD L,A
02760         LD A,D
02770         RLA
02780         RLA
02790         RLA
02800         LD E,A
02810         LD A,B
02820         SUB E
02830         CP 0
02840         RET Z
02850 ADDR1   INC H
02860         DEC A
02870         JR NZ,ADDR1
02880         RET
02890 ;_____________________
02900 ;**********************
02910 ;** FOR INTERNAL USE **
02920 ;**********************
02930 CHARS   EQU 23606
02940 UDG     EQU 23675
02950 CHAR    DEFB 0
02960 XCOOR   DEFB 0
02970 YCOOR   DEFB 0
02980 FONT    DEFB 0
02990 VARSC   DEFB 0
03000 MAX     DEFW 0
03010 REMAN   DEFB 0
03020 WHOLE   DEFB 0
03030 WORKS   DEFM /00000000/
```

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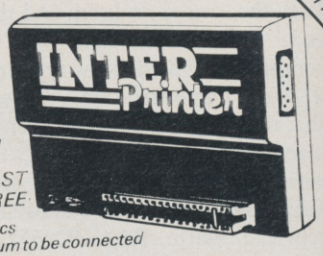

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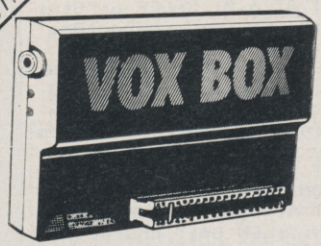

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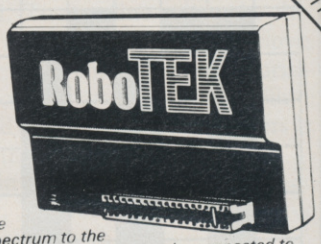

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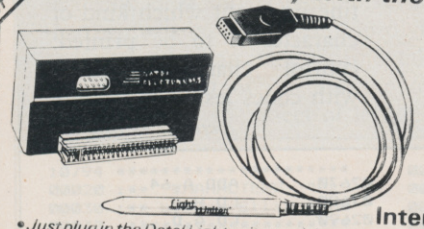

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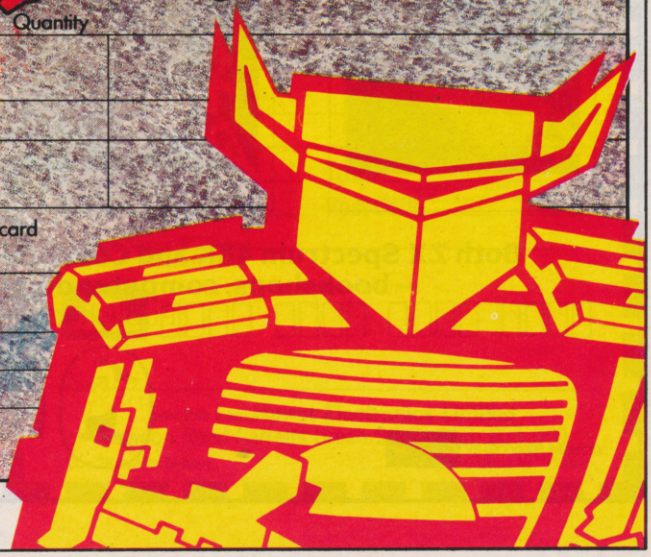

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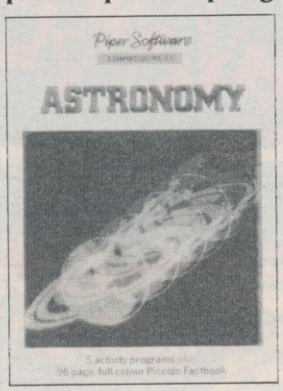

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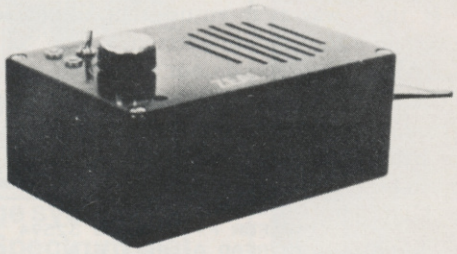

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continued from page 191

printed as normal; keyword tokens, characters with codes greater than 164, are not printed at all; any remaining characters are to be printed using the routine. Before a character can be printed the routine must find out where the data defining the character is stored. If the character is part of the 'normal' character set, i.e. its code is between 32 and 127 inclusive, then the bytes defining it are in the area starting at the address given by the system variable CHARS (23606)+256. If the character is a user-definable character, then the defining bytes are in the area pointed to by the system variable UDG (23675). If the character is a block graphic then the defining bytes are created by manipulating its character code. In all cases the 8 defining bytes are transferred to the workspace.

```
  50 CLEAR 64809
  60 FOR F=64810 TO 65325
  70 READ A: POKE F,A
  80 NEXT F
 200 DATA 221,33,32,255,221,54,0
,120,205,112,253,35,35,35,126
 210 DATA 50,29,255,221,54,0,121
,205,112,253,35,35,35,126,50
 220 DATA 30,255,221,54,0,102,20
5,112,253,35,35,35,126,254,6
 230 DATA 48,2,207,25,254,16,48,
250,50,31,255,221,54,0,83
 240 DATA 205,112,253,35,94,35,8
6,35,24,74,42,75,92,126,230
 250 DATA 224,254,96,40,22,254,1
60,40,28,254,128,40,34,254,224
 260 DATA 40,37,254,64,40,38,254
,192,40,22,207,1,126,221,190
 270 DATA 0,200,17,6,0,24,29,35,
203,126,40,251,17,6,0
 280 DATA 24,19,35,94,35,86,19,2
4,12,17,19,0,24,7,126
 290 DATA 221,190,0,200,24,237,2
5,24,185,229,213,58,31,255,33
 300 DATA 0,1,95,22,0,66,4,167,2
37,82,48,250,5,33,0
 310 DATA 0,25,16,253,43,34,33,2
55,209,225,126,50,28,255,229
 320 DATA 213,205,51,254,58,31,2
55,254,8,32,14,58,29,255,254
 330 DATA 241,48,32,198,8,50,29,
255,24,51,58,29,255,111,38
 340 DATA 0,58,31,255,95,84,25,1
25,50,29,255,237,91,33,255
 350 DATA 167,237,82,56,26,175,5
0,29,255,58,30,255,214,8,50
 360 DATA 30,255,48,12,198,8,50,
30,255,253,203,2,134,205,210
 370 DATA 12,209,225,35,27,123,1
78,32,167,201,58,28,255,254,32
 380 DATA 48,2,215,201,254,165,2
08,254,144,48,28,254,128,48,32
 390 DATA 214,32,237,91,54,92,20
,111,38,0,41,41,41,25,17
 400 DATA 37,255,1,8,0,237,176,2
4,65,214,144,237,91,123,92
 410 DATA 24,231,30,0,214,128,25
4,8,56,6,71,62,15,144,30
 420 DATA 255,87,6,2,33,37,255,1
97,175,203,26,48,2,246,240
 430 DATA 203,63,203,63,203,63,2
03,63,203,26,48,2,246,240,203
 440 DATA 123,40,2,167,47,6,4,11
9,35,16,252,193,16,219,58
 450 DATA 29,255,14,0,12,214,8,4
8,251,13,198,8,50,35,255
 460 DATA 121,50,36,255,6,8,17,3
7,255,58,30,255,128,111,62
 470 DATA 176,149,56,50,197,71,5
8,36,255,79,213,205,249,254,229
 480 DATA 205,219,11,225,229,58,
35,255,35,254,0,196,219,11,225
 490 DATA 209,14,0,58,35,255,185
,71,26,40,6,203,63,203,25
 500 DATA 16,250,174,119,35,121,
174,119,193,19,16,193,201,120,23
0
 510 DATA 248,31,31,31,87,230,24
,198,64,103,122,230,7,15,15
 520 DATA 15,129,111,122,23,23,2
3,95,120,147,254,0,200,36,61
 530 DATA 32,252,201,76,64,10,6,
83,251,0,2,7,0,64,64
 540 DATA 64,64,64,126,0,0
```

Listing 3.

WHERE: This uses the current row and column values to find the correct address in the display file for each of the eight bytes of the character. It also colours the appropriate attribute squares.

The position at which text is started is defined by the values of the simple numeric variables x and y. X is the x coordinate of the pixel at the bottom left of the first character, and y is the y coordinate. If y is greater than 167 then part or all of the start of the text will be printed off the top of the screen.

The simple variable f contains the number of x pixels per character grid. For the relation between f and the characters printed per line, see Table 1.

The variables x and y follow the coordinate system for high resolution plotting as opposed to the PRINT AT coordinate system. That gives a range of 0 to 255 for x, and to 175 for y.

S$ contains the text to be printed and must be a simple string. To print an element of a string array, for example, element three of array X$, use LET S$=X$(3), and then proceed.

To set the colours of the text a PRINT line may be inserted before the call to Multipitch:

PRINT PAPER 3; INK 7; FLASH 1; RANDOMIZE USR 64810/32080

would print the text in flashing white on magenta. If the required attribute value is known then it may be POKEd directly into ATTRT (23695).

Note that unless specified then the value will default to that held in BORDCR (23624).

It is a good idea to ensure that the parameters x, y and f are being held in small integer form, especially if their values are derived by calculation, by inserting the following line:

LET X=INT X: LET Y=INT Y: LET F=INT F

The colours of the text are always loaded into the attribute file in such a way as to ensure that all characters in the text are affected.

If you do not want to type the program in, then send a postal order for £2.50 to the author at 29 Ashridge Drive, Bricket Wood, St. Albans, Herts, AL2 3SR for a cassette.

```
  50 CLEAR 32079
  60 FOR F=32080 TO 32594
  70 READ A: POKE F,A
  80 NEXT F
 200 DATA 221,33,70,127,221,54,0
,120,205,150,125,35,35,35,126
 210 DATA 50,67,127,221,54,0,121
,205,150,125,35,35,35,126,50
 220 DATA 68,127,221,54,0,102,20
5,150,125,35,35,35,126,254,6
 230 DATA 48,2,207,25,254,16,48,
250,50,69,127,221,54,0,83
 240 DATA 205,150,125,35,94,35,8
6,35,24,74,42,75,92,126,230
 250 DATA 224,254,96,40,22,254,1
60,40,28,254,128,40,34,254,224
 260 DATA 40,37,254,64,40,38,254
,192,40,22,207,1,126,221,190
 270 DATA 0,200,17,6,0,24,29,35,
203,126,40,251,17,6,0
 280 DATA 24,19,35,94,35,86,19,2
4,12,17,19,0,24,7,126
 290 DATA 221,190,0,200,24,237,2
5,24,185,229,213,58,69,127,33
 300 DATA 0,1,95,22,0,66,4,167,2
37,82,48,250,5,33,0
 310 DATA 0,25,16,253,43,34,71,1
27,209,225,126,50,66,127,229
 320 DATA 213,205,89,126,58,69,1
27,254,8,32,14,58,67,127,254
 330 DATA 241,48,32,198,8,50,67,
127,24,51,58,67,127,111,38
 340 DATA 0,58,69,127,95,84,25,1
25,50,67,127,237,91,71,127
 350 DATA 167,237,82,56,26,175,5
0,67,127,58,68,127,214,8,50
 360 DATA 68,127,48,12,198,8,50,
68,127,253,203,2,134,205,210
 370 DATA 12,209,225,35,27,123,1
78,32,167,201,58,66,127,254,32
 380 DATA 48,2,215,201,254,165,2
08,254,144,48,28,254,128,48,32
 390 DATA 214,32,237,91,54,92,20
,111,38,0,41,41,41,25,17
 400 DATA 75,127,1,8,0,237,176,2
4,65,214,144,237,91,123,92
 410 DATA 24,231,30,0,214,128,25
4,8,56,6,71,62,15,144,30
 420 DATA 255,87,6,2,33,75,127,1
97,175,203,26,48,2,246,240
 430 DATA 203,63,203,63,203,63,2
03,63,203,26,48,2,246,240,203
 440 DATA 123,40,2,167,47,6,4,11
9,35,16,252,193,16,219,58
 450 DATA 67,127,14,0,12,214,8,4
8,251,13,198,8,50,73,127
 460 DATA 121,50,74,127,6,8,17,7
5,127,58,68,127,128,111,62
 470 DATA 176,149,56,50,197,71,5
8,74,127,79,213,205,31,127,229
 480 DATA 205,219,11,225,229,58,
73,127,35,254,0,196,219,11,225
 490 DATA 209,14,0,58,73,127,185
,71,26,40,6,203,63,203,25
 500 DATA 16,250,174,119,35,121,
174,119,193,19,16,193,201,120,23
0
 510 DATA 248,31,31,31,87,230,24
,198,64,103,122,230,7,15,15
 520 DATA 15,129,111,122,23,23,2
3,95,120,147,254,0,200,36,61
 530 DATA 32,252,201,0,0,0,0,0,0
,0,0,0,48,48,48
 540 DATA 48,48,48,48,48
```

Listing 4.

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How much would you expect to pay for a dual 128K fast access storage system for your Spectrum that included Centronics and RS232 interfaces and free word processing software as standard?

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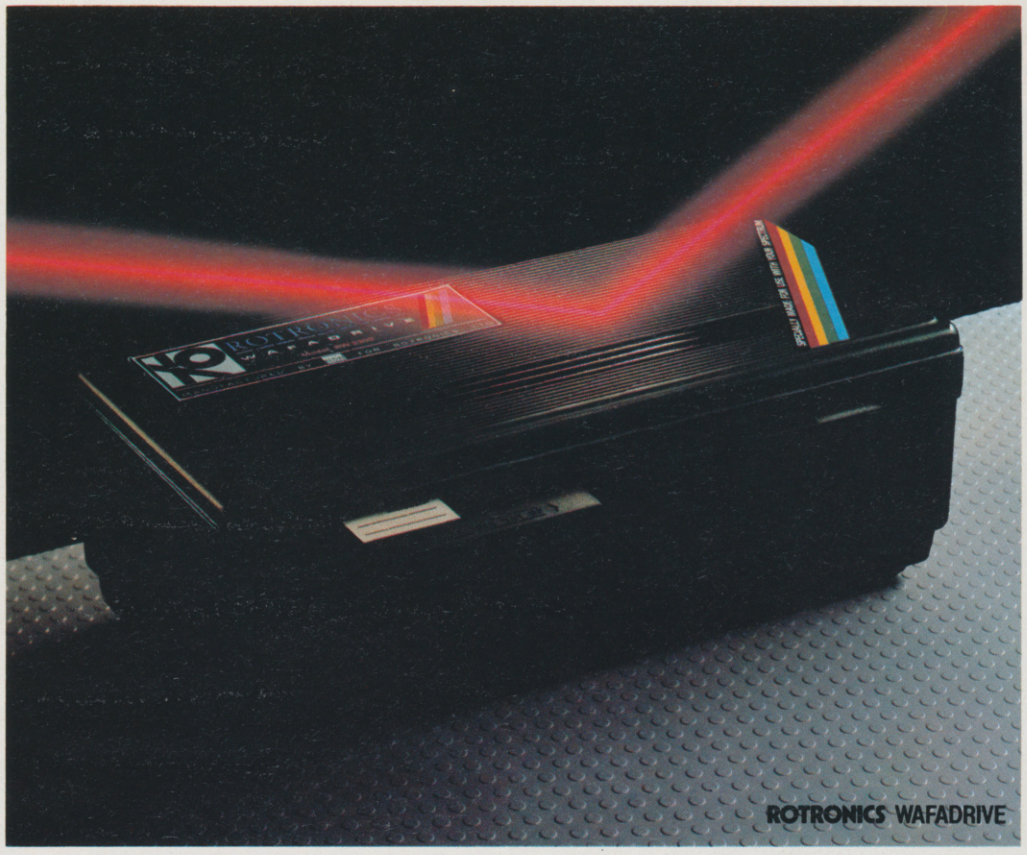

A fast reliable dual-drive storage system

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The Wafadrive is a complete system which contains the micro interface, two 128K drives, RS232 and Centronics ports, all in one attractively-styled, compact unit. There is a minimum of connecting leads and no extra boxes to clutter the desk top. Like the majority of professional systems, the units are dual drive. This offers the optimum balance between system flexibility and cost. Built-in serial and parallel interfaces allow the direct connection of just about any popular printer.

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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.

Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the QL computer is big enough for use in small businesses, the Sinclair computers are not really suitable for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 202

continued from page 201

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

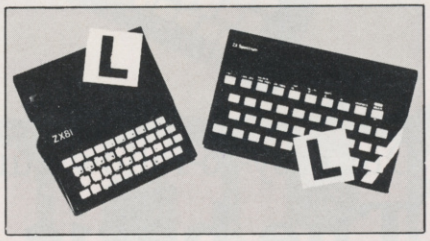
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

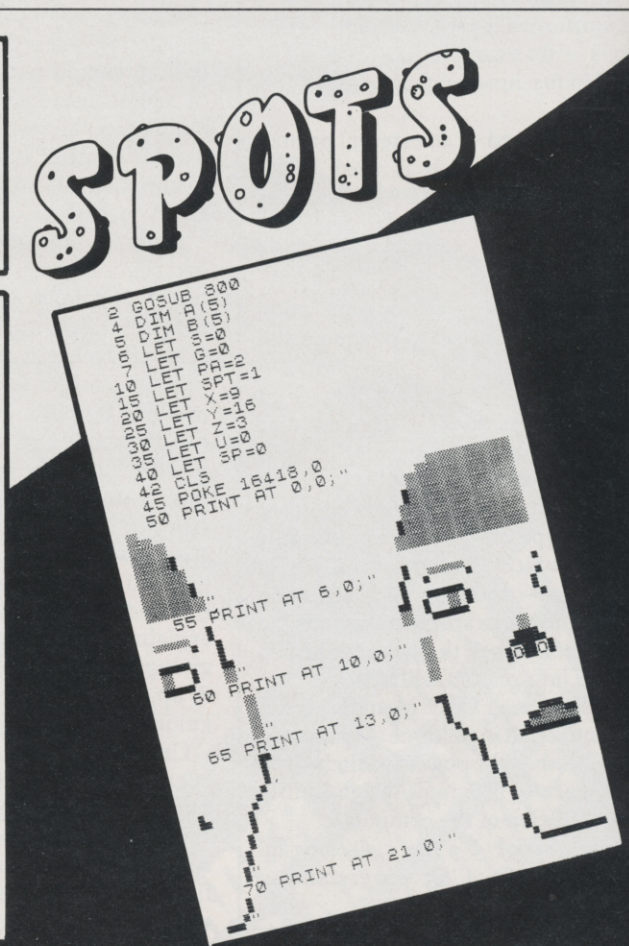
By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

SPOTS

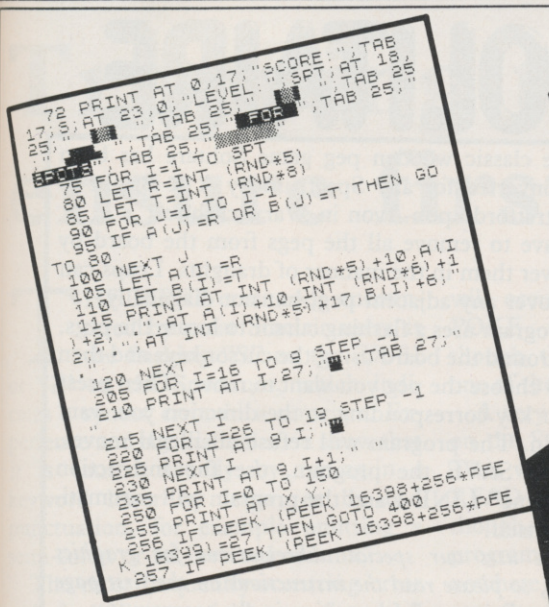
Fred has a personal problem. His face is full of spots. You control the spot bug which travels across Fred's face devouring the spots. Beware however, as you must avoid wandering over the sensitive parts of Fred's face. You must also clear away all the spots before Boris the spider steals your energy jar.

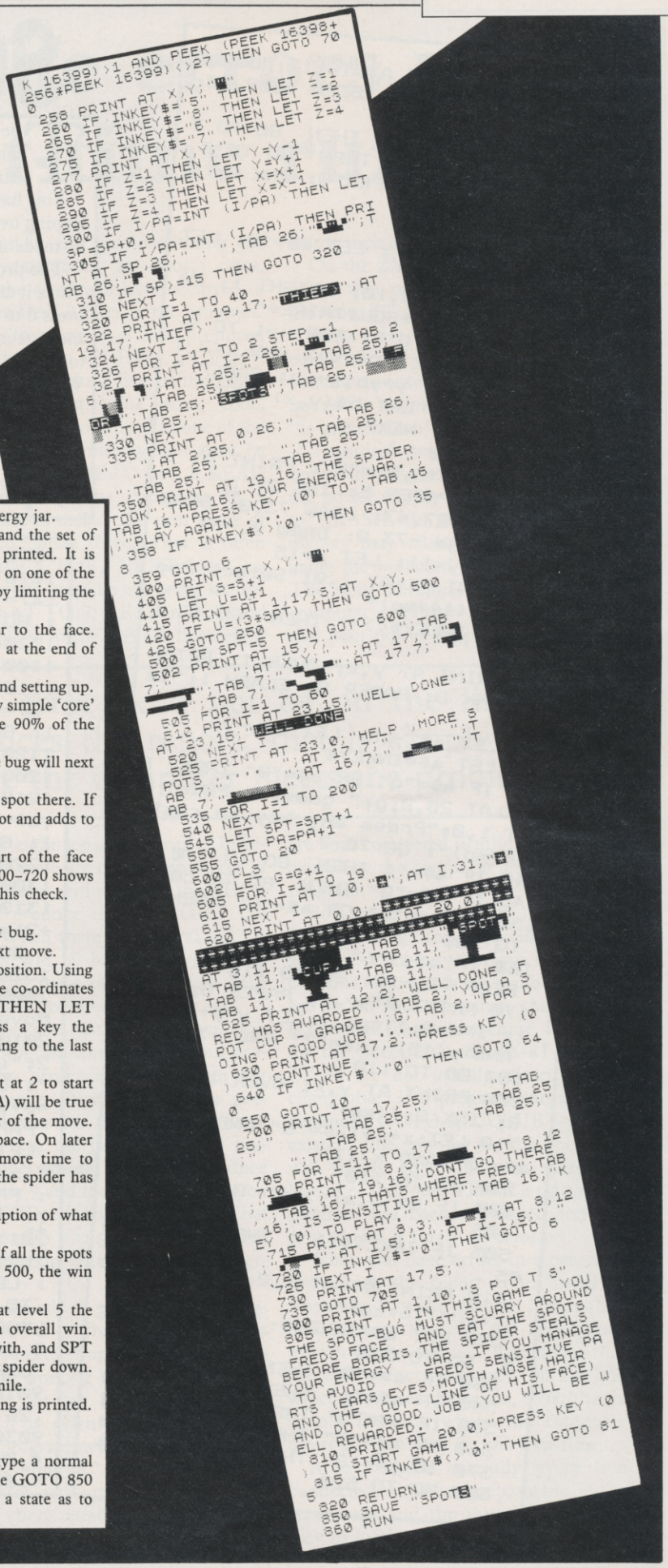
Spots was written on the 16K ZX-81 by Pascual Nicholson from Lowestoft in Suffolk.



Variables:

A( ), B( )	Arrays used to hold the positions of the spots on the face while they are being generated.
S	The score.
G	Your grade if you win.
PA	Controls the rate at which the spider descends.
SPT	The level.
X, Y	Co-ordinates for the spot bug.
Z	Indicates which key was last pressed.
U	The number of spots you have cleared.
SP	The vertical co-ordinate of the spider.
I	Used for most loops, in particular the main game loop, and thus indicates the number of moves.
J	Used for a loop within a I loop.
R, T	Used during the generation of the co-ordinates for the spots to store the initial random numbers.
Line 2	Immediately sends the program to the subroutine at line 800 which prints the instructions for the game.
Line 4–40	Set up initial values for some of the main variables in the program.
Line 45	16418 is the address of one of the ZX-81 system variables. In this case it is the store which holds the number of lines to be reserved at the bottom of the screen for error reports and the like. By POKEing zero into the store Pascual gives himself more space to draw the picture.
Lines 50–70	Print Fred's face onto the screen.





Line 72 Print information for the player, and the energy jar.

Lines 75–120 There are to be three spots for each level, and the set of nested loops decides where they are to be printed. It is important to ensure the spots are not printed on one of the features of face. Line 115 makes sure of that by limiting the area to three specific sets of locations.

Lines 205–235 Animate the spot bug to move from the jar to the face. What would happen if you left out the " " at the end of lines 210 and 235?

Lines 250–315 The game itself—all the rest is presentation and setting up. Some of the best commercial games have very simple 'core' routines for playing the game and then use 90% of the memory for fancy graphics and polish.

Line 255 Sets the print position according to where the bug will next move to.

Line 256 Reads the screen to see whether there is a spot there. If there is the routine at 400–425 deletes the spot and adds to the score.

Line 257 Reads the screen to see whether there is part of the face there. If so you have lost and the routine at 700–720 shows Fred's eye blinking and a tear rolling down his check.

Line 258 Prints the bug in the new position.

Lines 260–275 Reads the keyboard to let you move the spot bug.

Line 277 Deletes the spot bug preparatory to your next move.

Lines 295 Alter the co-ordinates for the new spot bug position. Using the variable z instead of directly changing the co-ordinates from INKEY$—e.g. IF INKEY$="5" THEN LET Y=Y−1—means that if you do not press a key the computer will go on moving the bug according to the last key pressed.

Lines 300–315 Deal with the spider. The variable PA is set at 2 to start with, and the expression IF I/PA=INT (I/PA) will be true once in every two moves, I being the number of the move. If it is true then the spider moves down a space. On later levels PA will be larger so you will have more time to remove the spots. Line 310 checks to see if the spider has reached the energy jar.

Lines 320–359 Print the spider removing the jar and a description of what has happened.

Lines 400–425 The routine for deleting a spot. At line 420, if all the spots have been deleted the computer goes to line 500, the win routine.

Lines 500–555 You have cleared all the spots. If you are at level 5 the program jumps to the routine at 600 for an overall win. Otherwise you are given more spots to deal with, and SPT is adjusted for the level, and PA to slow the spider down. The picture is changed also to make Fred smile.

Lines 600–650 The final screen congratulating you on winning is printed.

Lines 700–735 The losing routine mentioned above.

Lines 800–820 The instructions subroutine.

Line 850 Do not worry about the inverse letter, just type a normal letter S. After checking the whole listing, type GOTO 850 and the program will SAVE itself, in such a state as to automatically RUN when LOADed again.

SOLITAIRE

The classic wooden peg game Solitare has been converted for any Spectrum by A R Bright of Stratford-upon-Avon in Warwickshire.

You have to remove all the pegs from the board by leaping over them in the manner of draughts. Leaps can be made over any adjacent peg, but not diagonally.

The program uses a flashing cursor to locate the pegs. Move it around the board using the cursor keys and then press 0 to choose the peg you want to move. Then press the cursor key corresponding to the direction you want to move in. The program will refuse all illegal moves. When you SAVE the program, use the instruction SAVE "name" LINE 1 and the program will automatically run itself.

Solitaire uses our special abbreviations for graphics characters, so please read the instructions on the first page of Program Printout before typing in the program.

```
  1 CLS : PRINT AT 10,12;"LOADE
D": FOR n=1 TO 60: BEEP .009,20:
 NEXT n
  7 IF INKEY$<>"" THEN  GO TO 7
  8 IF INKEY$="" THEN  GO TO 8
  9 BORDER 0: PAPER 0: INK 7: C
LS
  10 GO SUB 9000
  20 DIM b$(9,9): LET xb=10: LET
 yb=6
  25 PRINT AT 0,10; BRIGHT 1; PA
PER 2; INK 6;"*SOLITAIRE*"
  30 FOR y=1 TO 9: FOR x=1 TO 9:
 IF y>3 AND y<7 OR x>3 AND x<7 T
HEN  PRINT AT y+yb,x+xb; PAPER 5
; INK 0;"A": LET b$(y,x)="A"
  40 NEXT x: NEXT y
  45 LET g=0
  50 LET b$(5,5)="E": PRINT AT 5
+yb,5+xb; PAPER 5; INK 2;"D"
  80 PLOT 87,47: DRAW 73,0: DRAW
 0,73: DRAW -73,0: DRAW 0,-73
  100 LET y=11: LET x=15
  105 PRINT #1;AT 1,0;"Select Peg
 to move(14*sp)"
  107 IF INKEY$<>"" THEN  GO TO 1
07
  120 PRINT AT y,x; OVER 1; BRIGH
T 1; INK 8; PAPER 8; FLASH 1;"(s
p)"
  130 LET a=x-xb: LET b=y-yb
  136 LET a$=INKEY$
  137 IF a$="q" OR a$="Q" THEN  P
RINT AT 20,0;g;" goes.": PRINT #
1;AT 1,0;"Press any key to resta
rt(8*sp)": GO TO 7
  140 IF a$="" THEN  GO TO 110
  145 IF a$="0" THEN  GO TO 500
  150 IF a$="5" OR a$="8" THEN  G
O TO 200
  160 IF a$<>"6" AND a$<>"7" THEN
  BEEP .2,-10: GO TO 110
  170 PRINT AT y,x; PAPER 8; OVER
 1; INK 8;"(sp)": LET y=y+(a$="6
" AND y<15)-(a$="7" AND y>7)
  180 GO TO 110
  200 PRINT AT y,x; OVER 1; PAPER
 8; INK 8;"(sp)"
  210 LET x=x+(a$="8" AND x<19)-(
a$="5" AND x>11)
  220 GO TO 110
  500 IF b$(b,a)<>"A" THEN  GO TO
 105
  505 IF INKEY$<>"" THEN  GO TO 5
05
  510 PRINT #1;AT 1,0;"Select dir
ection(16*sp)"
  520 LET a$=INKEY$: IF a$="" THE
N  GO TO 520
  530 IF a$="0" THEN  GO TO 105
  540 IF a$="6" THEN  GO TO 1000
  550 IF a$="5" THEN  GO TO 1100
  560 IF a$="7" THEN  GO TO 1200
  570 IF a$="8" THEN  GO TO 1300
  580 GO TO 520
```

```
1000 IF b>7 THEN  GO TO 500
1010 IF b$(b+1,a)="A" AND b$(b+2
,a)="E" THEN  LET yd=1: LET xd=0
: GO TO 2000
1020 GO TO 500
1100 IF a<3 THEN  GO TO 500
1110 IF b$(b,a-1)="A" AND b$(b,a
-2)="E" THEN  LET yd=0: LET xd=-
1: GO TO 2000
1120 GO TO 500
1200 IF b<3 THEN  GO TO 500
1210 IF b$(b-1,a)="A" AND b$(b-2
,a)="E" THEN  LET xd=0: LET yd=-
1: GO TO 2000
1220 GO TO 500
1300 IF a>7 THEN  GO TO 500
1310 IF b$(b,a+1)="A" AND b$(b,a
+2)="E" THEN  LET xd=1: LET yd=0
: GO TO 2000
1320 GO TO 500
2000 PRINT#1;AT 1,0;"Will Make
Move(18*sp)": BEEP .4,40
2010 PRINT AT y,x; PAPER 5; INK
2;"D": BEEP .2,5: LET b$(b,a)="E
": LET y=y+yd: LET x=x+xd: LET b
=b+yd: LET a=a+xd: PRINT AT y,x;
 PAPER 5; INK 2;"D": BEEP .3,30:
 LET b$(b,a)="E": LET y=y+yd: LE
T x=x+xd: LET b=b+yd: LET a=a+xd
: PRINT AT y,x; PAPER 5; INK 0;"
A"
2015 LET g=g+1
2020 BEEP .3,25: LET b$(b,a)="A"
: LET x=x-2*xd: LET y=y-2*yd: GO
 TO 105
9000 RESTORE : FOR n=1 TO 2: REA
D a$: FOR z=0 TO 7: READ a: POKE
 USR a$+z,a: NEXT z: NEXT n
9010 DATA "a",0,24,60,126,126,60
,24,0
9030 DATA "d",0,24,36,66,66,36,2
4,0
9100 RETURN
```

Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and $1\frac{1}{2}$ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 11111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "< >" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.

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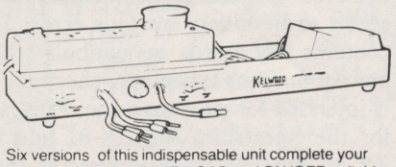

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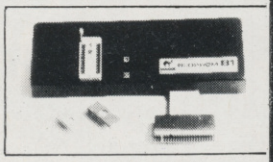

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EPROM ST. ADDR —0000
JOB LENGTH —4000
TASK —CHECK

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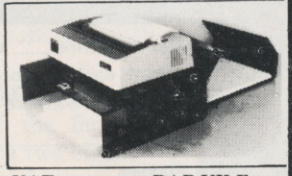

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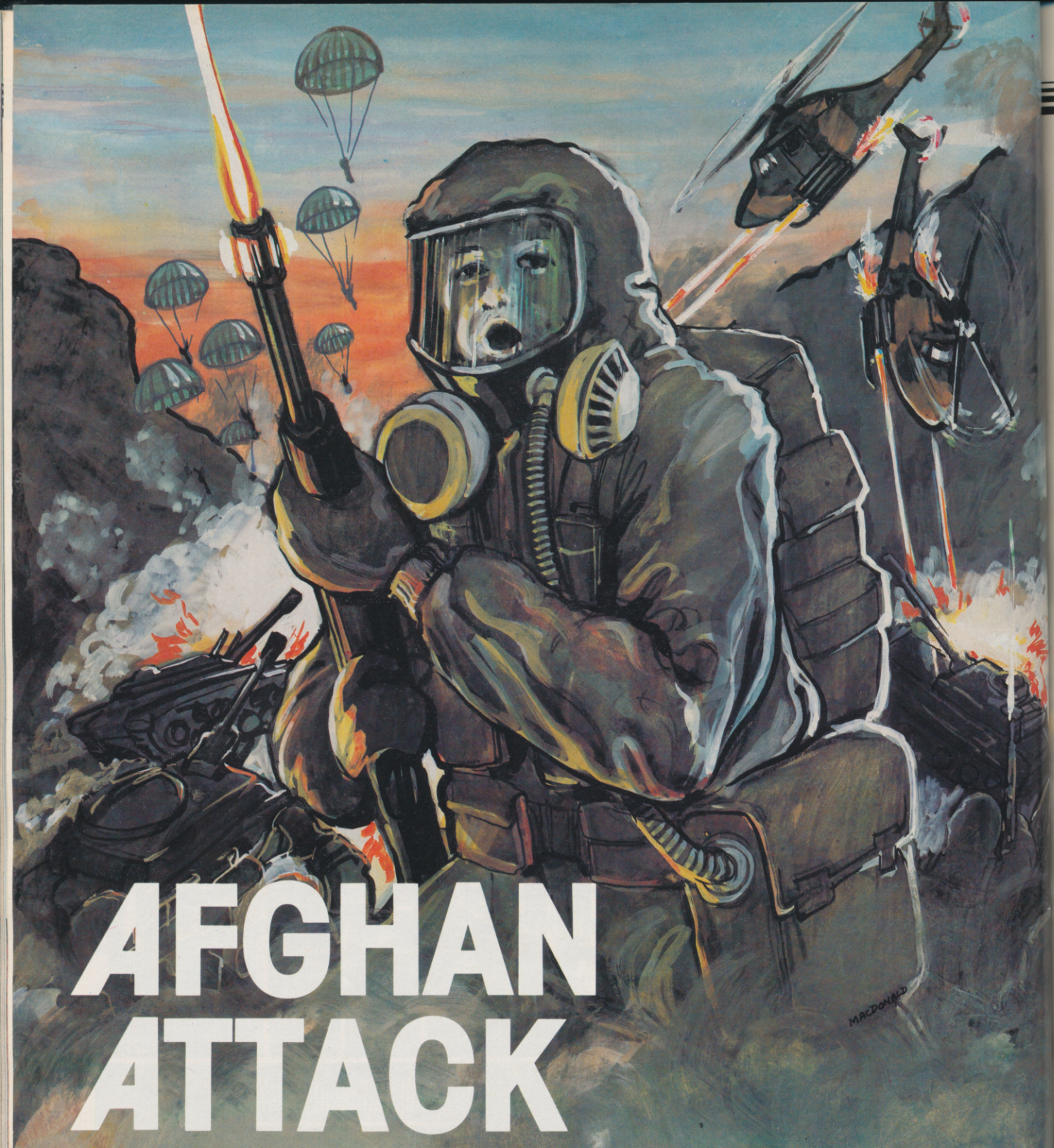

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Quentin Heath's Christmas Quiz

The master of strategy himself dips into his lore-books and sets ten demanding questions guaranteed to separate the trolls from the orcs.

CHRISTMAS IS traditionally a time for looking back at events of the past year and that is the theme of *Mind Games* this month.

You will have an opportunity to do some work for a change to see how good you are at adventure games. The puzzles are a jumble of traditional quizzes and brainteasers together with the practical applications of gaming illustrated in *Mind Games* earlier this year. Do not worry if you come across a problem that you cannot solve, hints will be given, sometimes as to where you can find the solution.

When you have done your best then consult the answers on page 238 to find how many you solved correctly. Then turn to the Gold Points section on this page and discover your mind game percentage score.

QUESTIONS

1. **Character Attributes.** In the October issue we discussed how characters within adventures can be created by setting up emotional and physical attributes within a matrix. Two matrices were given for characters showing their endurance, strength, lawful, and intelligence traits. Each of those were given a score between −10 and +10 where a positive sign showed the existence of that trait and negative sign showed the opposite of that trait. For instance, if Strength was −5 the character would be a weakling.

The two characters below are about to perform two actions. Firstly, they are going to argue. The loser of the argument will start a fight. Who is the loser of the argument and who wins that fight?

STAB	
Endurance	−1
Strength	+2
Lawful	+3
Intelligence	+8

Figure 1a.

SLAYMORE	
Endurance	+2
Strength	+4
Lawful	−3
Intelligence	−1

Figure 1b.

2. **Lords of Midnight.** What are the initials of the writer of the famous graphics adventure? Which two characters must fulfil the quests of the game?

3. **Wrath of Magra.** Which company took over Carnell Software in August? Name the adventures which make up the Third Continent Trilogy.

4. **Chess Techniques.** In the May issue of *Sinclair User* we described techniques for writing strategy games. What is a tree structure? Is it an infinite or absolute structure?

5. **The Hulk.** The jolly green giant thundered into the magazine in September, courtesy of Adventure International. Who wrote the game and where does it start? How does Banner become The Hulk? Clues for those questions can also be found in Marvel Superheroes comics.

6. **Mad Martha.** In the very successful game from MikroGen Martha was anything but a poor battered wife. She did most of the battering with an axe and it was her husband who suffered. What is the name of her husband who managed to survive the attempts on his life and went on to have his night out in **Mad Martha Two?**

7. **Valhalla.** How can you travel around the adventure without having to walk? Name one of the quest objects hidden in the adventure.

8. **The Hobbit.** How do you cross the Black River? Where is the ring? Who has the pleasure of killing Smaug the dragon and with what?

9. **Sherlock.** From which station must the famous detective leave to find his quarry and how does he get to that station? Who has been murdered? What is the name of the newspaper from which Watson gets most of his news?

10. **Lords of Time.** What is the mode of transport which the time traveller must take? How many time periods are there? Where can you hide your cache of discoveries? Answers to some of those questions can be found in April's *Mind Games.*

Gold Points

In order to find your percentage score:

1. give yourself 10 points for every correct answer. The top score possible is 220;
2. divide the score by 11 and multiply the result by five. You will then have a percentage score.

When you have done all that you will have your *Mind Games* Rating. Compare it with the chart below and you will see the level of understanding that you have of the market.

Percent	Level	Explanation
0–10	Beginner	Mind games and adventures are not really your forte are they?
10–25	Minor Mage	Learning, but could do better.
25–50	Puzzler	After much thought and with luck you can succeed.
50–75	Keeper of Secrets	You know all the answers.
75–100	Master Mage	Such games are meant for mortals not for those such as you.

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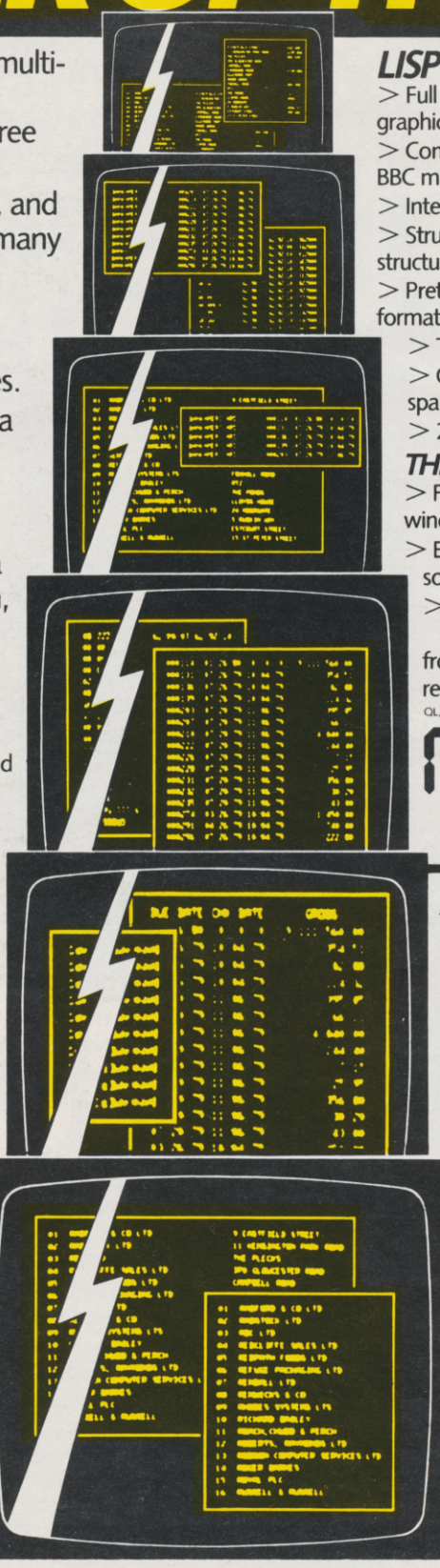

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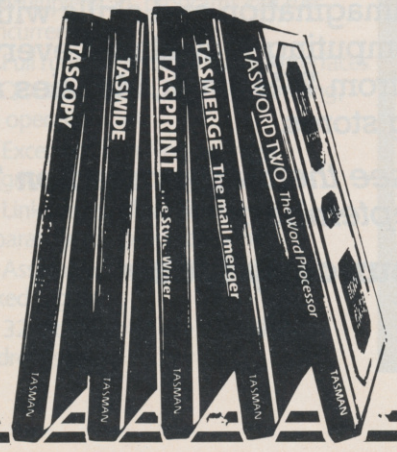

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Journey to the centre of the ROM

Andrew Hewson delves into the heart of the Z80 to unearth some useful routines.

SINCLAIR Research have manufactured three machines all based on the Z80 microprocessor: the ZX-80, the ZX-81 and the ZX Spectrum, and it is interesting to observe the development from one machine to the next.

A consequence of that understandable policy of developing one ROM from its predecessors is that some features which were necessary or desirable in the earlier version may be retained in the later version because the relevant code is known to work even though they impose constraints on the new design. This is, indirectly, the answer to the following question from John Blackwood of Wakefield who asks **"Why is 9999 the largest line number permitted on the ZX-81?"**

At first sight the limitation to 9999 seems quite illogical because 9999 is not a 'round number' as far as the Z80 microprocessor is concerned. A more logical upper limit might be 255 because that is the maximum integer which the machine can store in a single memory location — or byte. However, many users could be expected to write programs containing more than 255 lines and so a greater limit is desirable. The next highest 'round number' is 65535 which is the largest integer which the computer can store in two consecutive bytes. So why limit line numbers to 9999 when 65535 could be used just as easily?

The reason appears to be that by limiting line numbers in that way and by manipulating the numeric codes for variables the ZX-81 has a device for distinguishing lines in the program area from variables in the variables area.

To understand the mechanism at work, consider the binary representation of 9999. Line numbers are held with their most significant byte first. That is contrary to the usual Z80 convention so we can assume that the manufacturers had some special motive in choosing that arrangement. Hence line number 9999 is held as a byte containing 39 followed by a byte containing 15 because

39 * 256 + 15 = 9999

The bit pattern of the byte, obtained by converting 39 to binary, is 00100111. Notice that the three most significant bits — bit numbers 7, 6 and 5 are set to 0, 0 and 1 for this, the largest permitted line number. Hence bit numbers 7, 6 and 5 of the first byte of all permitted line numbers will be set to 0, 0 and 1, or in the case of line numbers less than 8192, they will be set to 0, 0, 0.

Now look at pages 172 to 174 of the *ZX-81 Basic Programming* manual and you will see illustrations of the different types of variables as they are represented in the variables area. In each case the first byte contains a numeric code related to the code of the letter which identifies the variable — or the code of the first letter of the variable name in the case of a number whose name is longer than one letter. The largest possible letter code is 63, the code for Z, which is still 00111111 in binary, and the smallest is 38, the code for A, which is 00100110 in binary.

Hence bits 7 and 6 are not needed when distinguishing between letter codes and as bit 5 is always set to one, the ZX-81 can use these bits to distinguish between the different types of variable. Three bits can be set in

2 * 2 * 2 = 8

different ways. Table 1 lists the eight ways and their interpretation.

It is strange that Sinclair should take such elaborate precautions to distinguish a line number from a variable because the same purpose could be served by comparing the address of the byte in question to the D-FILE or VARS system variables. It allows the ZX-81 to use the same routine, at 2546 to 2576, to step through memory to the 'next' line or the 'next' variable but that seems a small advantage.

It is certainly one of the

continued on page 214

Table 1. This shows the meaning of the top three bits in the first byte of a program line or Basic variable in the ZX-81 and the Spectrum.

Bit pattern	Interpretation
000	Line number less than 8192
001	Line number between 8192 and 9999
010	String
011	Number with single character name
100	Array of numbers
101	Number with multiple character name
110	Character array
111	Control variable for a FOR-NEXT loop

Table 2. A Spectrum program to PRINT the characters with codes in the range 32 to 255 inculsive. Note that when the a register contains 255, the effect of the inc a instruction is the same as subtracting 255, ie a subsequently contains zero.

Decimal	Assembly Code		Comment
62 32		ld a, 32	Load the a register with 32
245	Again	push af	Save a on the stack
215		rst 16	PRINT the character
241		pop af	Retrieve a from the stack
60		inc a	Increment the a register
32 250		jr nz , Again	Jump to PRINT next character
201		ret	Return when a reaches zero

Table 3. A simple decimal loader for POKEing decimal numbers into the Spectrum printer buffer. To halt the program enter STOP (Symbol Shift A).

```
10   FOR I = 23296 TO 23551
20   INPUT J
30   POKE I , J
40   PRINT I , J
50   NEXT I
```

continued from page 213

Table 4. A Spectrum routine to PRINT the names and types of all the current Basic variables.

Decimal	Assembly Code		Comment
42 75 92		ld hl, (23627)	VARS to hl
126	tend:	ld a, (hl)	128 is the end of VARS marker
254 128		cp 128	
200		ret z	
205 111 91		call setb	Set b register to 1 to 6
205 55 91		call prtvar	Print the name of the variable
205 67 91		call prtdol	Print the dollar sign if necessary
203 64		bit 0,b	Is b even?
40 5		jr z,even	If so jump
205 125 91		call addlen	No, addlen skips over the data
24 22		jr prtres	Skip to prtres
203 80	even:	bit 2,b	b is even. Is it 2?
40 15		jr z, two	If so jump
203 72		bit 1,b	Is b 4?
40 8		jr z, four	If so jump
213		push de	b is 6 so this is a loop counter
17 13 0		ld de, 13	Skip over 13 bytes
25		add hl,de	
209		pop de	
24 3		jr two	
205 141 91	four:	call lonvar	This is a long variable
205 134 91	two:	call addsix	Skip over remaining six bytes
205 77 91	prtres:	call prtype	Print type of variable
62 13		ld a,13	Output the enter character
215		rst 16	
24 204		jr tend	
197	prtvar:	push bc	This routine decodes and prints the
198 32		add 32	(first letter of the) variable held
16 3	tryb:	djnz decb	in the a register
215		rest 16	
193		pop bc	
201		ret	
214 32	decb:	sub 32	
24 247		jr tryb	
203 64	prtdol:	bit 0,b	This routine prints a dollar sign
200		ret z	if b contains 1 or 5
203 72		bit 1,b	
192		ret nz	
62 36		ld a,36	
215		rst 16	
201	ret		
229	prtype:	push hl	This routine prints the appropriate
197		push bc	variable type taken from the table
33 168 91		ld hl,table	controlled by the value in b
16 7	dec:	djnz nexlet	
229		push hl	
205 95 10		call 0a5fh	Tab to column 16
225		pop hl	
24 8		jr out	
126	nexlet:	ld a, (hl)	Decrement b if the next letter has
35		inc hl	code 128
254 128		cp 128	
40 241		jr z,dec	When b is zero the correct entry
24 248		jr nexlet	has been found
126	out:	ld a, (hl)	Print each letter in turn, first
254 128		cp 128	checking for the 128 terminator
40 4		jr z,endpr	
215		rst 16	
35		inc hl	
24 247		jr out	
193	endpr:	pop bc	Restore bc
225		pop hl	and hl
201		ret	before returning
6 1	setb:	ld, b,1	This routine sets the value of b in
14 91		ld c,91	range 1 to 6 according to the value
185	nexb:	cp c	in the first byte of the variable name
216		ret c	
4		inc b	
121		ld a,c	
198 32		add 32	
79		ld c,a	
126		ld a,(hl)	
24 246		jr nextb	
213	addlen:	push de	This routine is used to skip over the
35		inc hl	body of the data for numeric arrays,
94		ld e,(hl)	strings and string arrays
35		inc hl	
86		ld d,(hl)	
35		inc hl	
25		add hl ,de	
209		pop de	
201		ret	
213	addsix:	push de	Used for simple variables and long
17 6 0		ld de,6	variables to skip over the body of
25		add he ,de	the data
209		pop de	
201		ret	
197	lonvar:	push bc	This routine prints up to ten
6 10		ld b,10	characters from a long variable name
35	nexlon:	inc hl	
55		scf	
126		ld a,(hl)	
254 128		cp 128	
48 12		jr nc,endlon	
215		rst 16	
16 246		djnz nexlon	
35	aglon:	inc hl	Discard any remaining characters
55		scf	after the tenth character has been
126		ld a,(hl)	printed
254 128		cp 128	
48 5		jr nc,endl	
24 247		jr aglon	
214 128	endlon:	sub 128	
215		rst 16	
193	endl:	pop bc	
201		ret	
83	table:	defb 83	
116		defb 116	
114		defb 114	
105		defb 105	
110		defb 110	
103		defb 103	
128		defb 128	
83		defb 83	
105		defb 105	
109		defb 109	
112		defb 112	
108		defb 108	
101		defb 101	
32		defb 32	
118		defb 118	
97		defb 97	
114		defb 114	
105		defb 105	
97		defb 97	
98		defb 98	
108		defb 108	
101		defb 101	
128		defb 128	
78		defb 78	
117		defb 117	
109		defb 109	
101		defb 101	
114		defb 114	
105		defb 105	
99		defb 99	
32		defb 32	
97		defb 97	
114		defb 114	
114		defb 114	
97		defb 97	
121		defb 121	
128		defb 128	
76		defb 76	
111		defb 111	
110		defb 110	
103		defb 103	
32		defb 32	
110		defb 110	
117		defb 117	
109		defb 109	
101		defb 101	
114		defb 114	
105		defb 105	

features which has been carried forward from the ZX-80 to the ZX-81 and then to the Spectrum.

We shall return to discussing Basic variables later but first a small but relevant digression is prompted by the following question from Patrick Higham of Manchester. He asks: **"Is there a simple method of printing characters on the Spectrum screen from a machine code routine?"**

Printing from machine code is very straightforward because the manufacturers have thoughtfully provided a routine in ROM to do all the hard work. The routine is called at address 16 decimal — 10 in hexadecimal — and should be accessed using the special Z80 machine code instruction

RST 16

That instruction, for some reason which has never been adequately explained, is called a 'restart' — hence the RST abbreviation — and is one of eight such special instructions. As far as the user is concerned it has the same effect as a CALL instruction except that only one byte instead of three is required to hold it.

The routine is entered with the A register set to the code of the character to be PRINTed and the appropriate character appears on the screen at the current PRINT position. All registers are preserved by the routine except the AF register pair and so in some circumstances it may be necessary to PUSH and POP AF before and after the RST instruction respectively.

The routine listed in table 2 demonstrates the use of RST 16 by using it to PRINT all characters with codes lying between 32 and 255 inclusive. Note that includes all the tokens so the routine demonstrates that command words like POKE, READ and DRAW can be PRINTed using RST 16 if required. The decimal codes for the routine can be loaded into the printer buffer using the decimal loader listed in table 3.

The RST 16 facility can also be used to control the screen format and layout character codes but a little care must be taken not to follow the INK, PAPER and other control codes by invalid numbers because otherwise error code K results. Some of those layout characters are extremely useful, for example

LD A , 13
RST 16

will PRINT an 'ENTER' character so that the current PRINT position will move to the start of the next line.

Of course, the PRINT routine at address 16 was not provided by the manufacturers solely for the benefit of users of the finished machine. The Spectrum ROM itself makes extensive use of the facility and so it is littered with RST 16 instructions. That goes some way to explaining the power of RST instructions. Every time one is used two bytes of memory are saved — the difference between the length of a CALL and a RST instruction — and more importantly the Z80 does not waste time calculating the address which is being called because it is implicit in the instruction. Hence RST is very useful for calling routines which are used frequently.

The call to RST 16 is an important part of the routine which is listed in table 4 in response to the following letter from Alan Procter of Windsor: **"Have you a routine to identify the variables existing in memory, identifying them as numerics, string simple or array?"**

The routine is rather longer than the ones I usually include in this column and so I recommend that an assembler program is used to load it into memory. Please note that the routine is not relocatable ie if the decimal codes are used it can only be loaded into the printer buffer starting at 23296.

The routine contains six subroutines which I have called setb, prtvar, prtdol, addlen, lonvar, addsix and prtype. Those perform the following functions:

setb There are six different types of Basic variables and this subroutine looks at the first byte of the current variable and puts the corresponding value into the b register. Table 5 shows the types and the value of b.

prtvar Each type of Basic variable except one has a single character name. This subroutine decodes the character code by successively subtracting 32 and PRINTs the result.

prtdol If the current variable is a string or a string array, this subroutine PRINTs a dollar sign to follow the single character name.

addlen The two bytes following the single byte name of strings, string arrays and character arrays contain a number equal to the number of byte used to store all the data in the variable. This routine adds this number to the pointer in hl so that the next variable can be found.

lonvar This routine PRINTs up to ten characters of the name of a numeric variable with a multiple character name and moves the hl pointer to the end of the variable name.

addsix Six bytes are used to hold the data in numeric variables. This subroutine adds six to the hl pointer so that the next variable can be found.

prtype This subroutine TABs to column 16 using the ROM routine at OA5Fh and then PRINTs the appropriate variable type as determined from the value in the b register from the list of types held in the 'table' at the end of the routine.

Table 5. The codes placed in the b register by the "setb" routine in table 4 and the corresponding variable types.

b register	Type of variable
1	String of characters
2	Simple numeric variable
3	Numeric array
4	Numeric variable with multiple character name
5	String array
6	Loop counter

Table 4 continued

Decimal	Assembly Code	Comment
99	defb 99	
128	defb 128	
83	defb 83	
116	defb 116	
114	defb 114	
105	defb 105	
110	defb 110	
103	defb 103	
32	defb 32	
97	defb 97	
114	defb 114	
114	defb 114	
97	defb 97	
121	defb 121	
128	defb 128	
76	defb 76	
111	defb 111	
111	defb 111	
112	defb 112	
32	defb 32	
99	defb 99	
111	defb 111	
117	defb 117	
110	defb 110	
116	defb 116	
101	defb 101	
114	defb 114	
128	defb 128	

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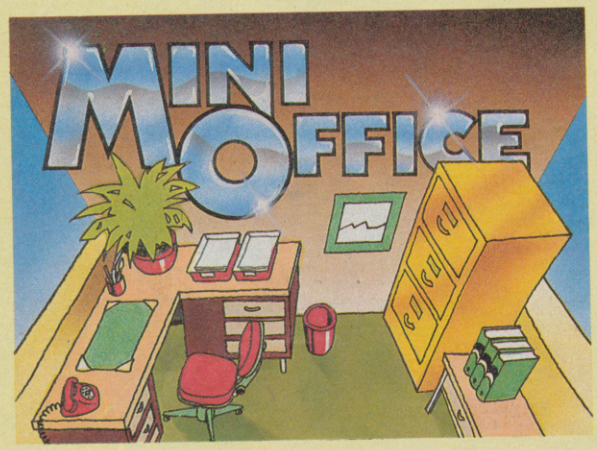

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THE sinclair VISION QL MONITOR

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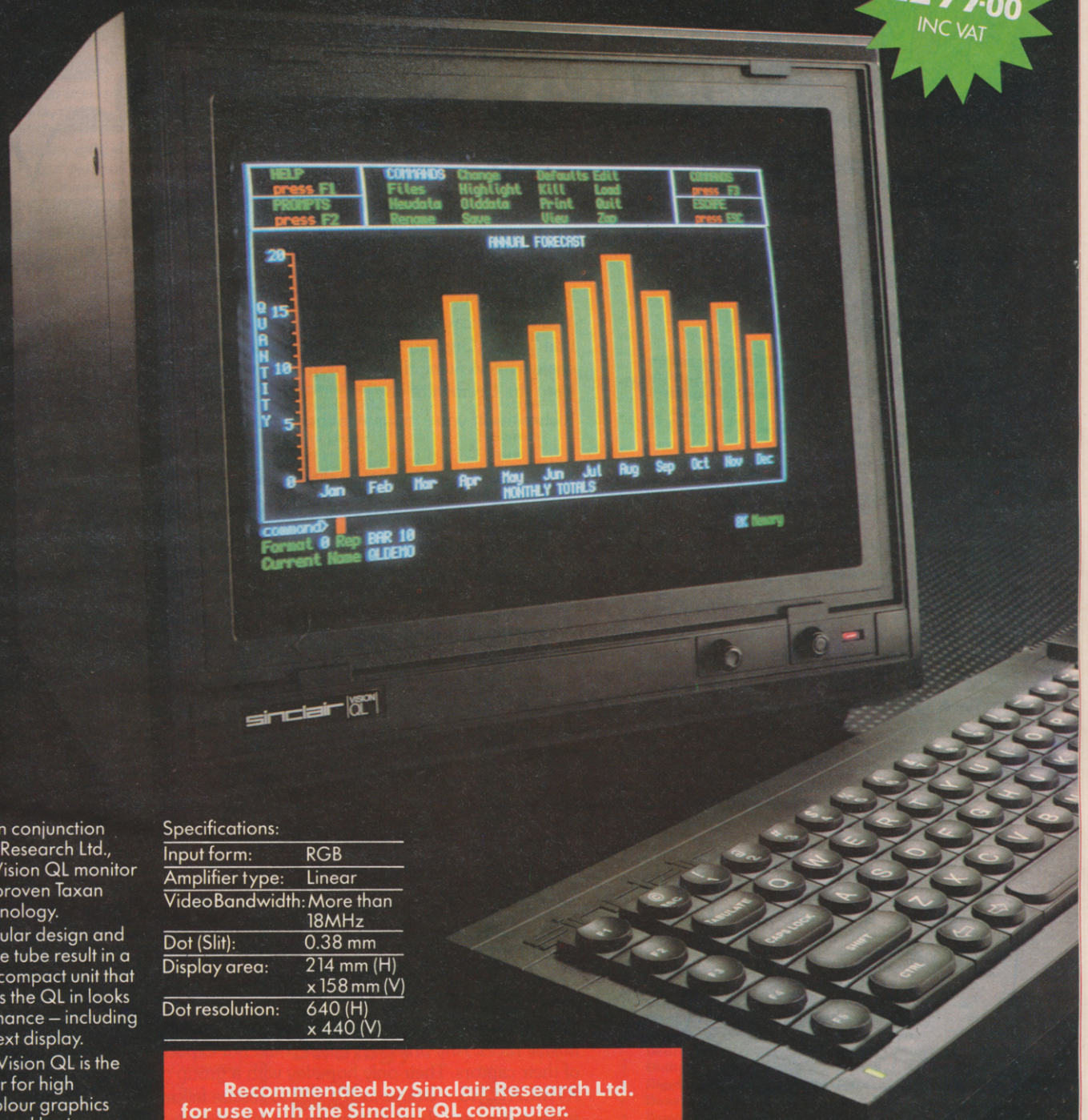

Developed in conjunction with Sinclair Research Ltd., the Sinclair Vision QL monitor is based on proven Taxan monitor technology.

Its black angular design and 12" non-glare tube result in a remarkably compact unit that complements the QL in looks and performance – including 85 column text display.

The Sinclair Vision QL is the ideal monitor for high resolution colour graphics and professional business applications.

Comes complete with cable and full 12 months warranty.

Specifications:

Input form:	RGB
Amplifier type:	Linear
VideoBandwidth:	More than 18MHz
Dot (Slit):	0.38 mm
Display area:	214 mm (H) x 158 mm (V)
Dot resolution:	640 (H) x 440 (V)

Recommended by Sinclair Research Ltd. for use with the Sinclair QL computer.
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LOOK!

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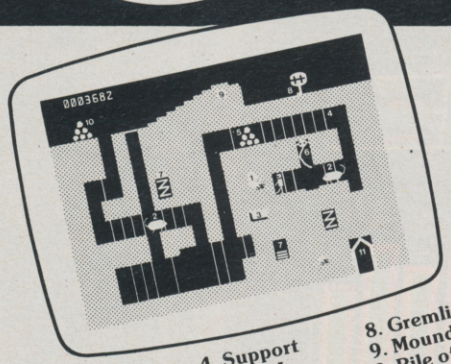
HI-RES PROGRAMS FOR THE 16K ZX-81



1. Nuggets
2. Giant Rats
3. Burrowing Rat
4. Support
5. Cave In
6. Snake
7. Snake Nest
8. Gremlin
9. Mound
10. Pile of Earth
11. Cave

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In 1849 the Great American Gold Rush started. Almost everyone who could sold up everything and dashed to the west coast to look for this precious metal – including you!

You must excavate this precious metal – but can you survive the giant rats and that vicious Gremlin which will come to infest your mine? Can you trick the snakes into leaving their comfortable nests and destroy the rats for you? Can you keep the Gremlin at bay?

Riches await you – but so do the hazards!

ROCKET MAN

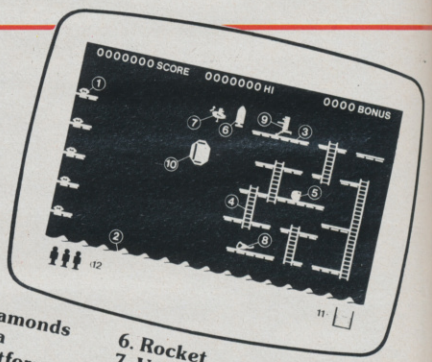
Get rich quick by collecting Diamonds that are simply lying there waiting for you!

Oh . . . I forgot to mention that there are one or two problems!

There is an expanse of shark infested water between you and the Diamonds and a strange breed of Bubble that seems hell bent on getting you in it! Somehow you must cross it . . . .

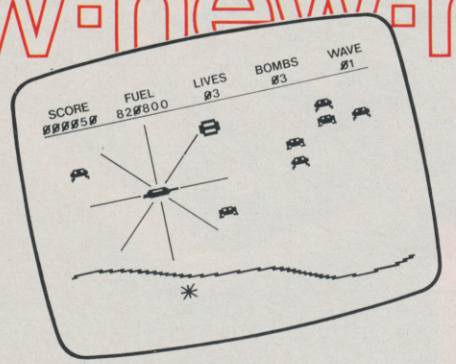
You have a Rocket Pack to help you (a Vulture on higher levels) but you must rush around the platforms and ladders collecting cans of fuel (legs of lamb with the Vulture) and cursing that weird Bubble. Once you have enough fuel then it's Chocks Away!

Oh . . . but don't run out of fuel on the way – otherwise it's . . . SPLASH!



1. Diamonds
2. Sea
3. Platforms
4. Ladders
5. Fuel Cans
6. Rocket
7. Vulture
8. Leg of Lamb
9. Player
10. Bubloid
11. Fuel Gauge
12. Men remaining

new-new-new-new-new-n



Z-XTRICATOR

A long time ago, in a galaxy far, far, away a terrible war took place between two hostile races. Any prisoners taken could not expect to live very long in the hands of their captors. Their only hope lay with a group of valiant warriors – the XTRICATORS – whose task it was to rescue fellow beings from the alien planet's surface. You are about to take on the role of such a warrior . . . .

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ZX-81

Adventure

Adventure	Bug-Byte	6
Adventure 1	Abersoft	6
Black Crystal	Mastervision	7
Dungeons of Doom	Woosoft	*
Espionage Island	Artic	*
Greedy Gulch	Phipps	7
Inca Curse	Sinclair	*
Knight's Quest	Phipps	*
Lost Island	JRS	*
Magic Mountain	Phipps	*
Merchant of Venus	Crystal	7
Pharoah's Tomb	Phipps	*
Pimania	Automata	6
Secret Valley	New soft	*
Serpents Tomb	Vortex	*
Ship of Doom	Artic	7
The Great Western	New Soft	*
Time Bandits	New Soft	*
Tomb of Dracula	Felix	*
Trader Trilogy	Quicksilva	6
Volcanic Dungeon	Mastervision	5
World of Illusions	Contrast	4

Arcade

Alien Dropout	Silversoft	*
Asteroids	Silversoft	8
Asteroids	Software Farm	6
Astral Convoy	Vortex	*
Bank Robber	Romik	6
Bears in the Wood	Unicorn	6
Bubble Bugs	Romik	6
Byter	Protek	*
Cassette 1	Orwin	7
Cassette 2-5	Orwin	7
City Patrol	Sinclair	7
Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxians	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games 2	JRS	*
Games Tape 1	J K Greye	*
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Gamestape 1	Fawkes Computing	7
Glooper	Quicksilva	7
Gloops	Quicksilva	5
Gobbleman	Artic	*
Gobbler	Software Farm	*
Grand Prix	dk'tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	5
Invaders	Odyssey	8
Invaders	Selec	7
Invaders	Silversoft	*
Krazy Kong	PSS	*
M. Mouse goes de-bugging	Lothlorien	7
Maze Death Race	PSS	*
Maze Man	Abersoft	*
Mazogs	Bug-Byte	8
Micro Mouse	Lothlorien	7
Namtir Raiders	Artic	8
Night Gunner	Digital Integration	5
Puckman	Hewson	*
Rocket Man	Software Farm	7
Sabotage	Sinclair	6
Six Games	A Stubbs	5
Space Raiders	Sinclair	*
Space Rescue	D. Pinch	7
Space Trek	JRS	*
3D Monster Maze	New Generation	9
Three Games Cassette	McGraw Hill	8
Zuckman	DJL	8
ZX Invasion Force	Artic	*
ZX Panic	Selec	4
ZX-81 1K Games Pack	Crystal	9
ZX-81 Pocket Book	Phipps	*

Business

Accounts (Limited company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Business Bank Account	Transform	*
Critical Path Analysis	Hilderbay	6
Draft	Myrmidon	*
Mailing List	Hestacrest	*
Payroll	Hilderbay	*
Payroll	Soft Tech	*
Payroll	Soft Tech	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Purchase Ledger	Hestacrest	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	*
Text	Contrast	8

Education

Calpac 1-2	Calpac	*
Four Rules of Number	Micro Master	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Linear Programming	University	*
Matrix Operations	University	7
O Level Chemistry	Calpac	*
O Level French Revision	Rose	*
O Level Maths Revision	Rose	*
Polynomials	University	*
Primary Arithmetic	Rose	*
Regression	University	*
Self-teach Program	Anvil	*

Language

Forth	Sinclair	7
ZX Forth	Artic	8

Practical

Ephemeris	Bridge	7
Football Pools	Hartland	*
Poolster	Naigram	3

Puzzle

Nowotnik Puzzle	Phipps	*
Word Fit	Ram Writer	6

Simulation

Flight Simulation	Sinclair	6
Pilot	Hewson	7
Print Shop	CCS	*

Strategy

Airline	CCS	7
Auto Chef	CCS	7
Battleships	JRS	*
Conflict	Martech	7
Cyborg Wars	Stratagem	7
Dallas	CCS	6
Dictator	Bug-Byte	7
Farmer	CCS	*
Fighter Pilot	Digital Integration	5
Football Manager	Addictive Games	7
Fort Apache	Contrast	8
Galaxy Conflict	Martech	8
Great Britain Ltd	Hessel	*
Ocean Trader	Quicksilva	7
Pioneer Trail	Quicksilva	7
Racehorse Trainer	G Barker	6
Racing League	Racing League Software	4

Traditional

Do Not Pass Go	Work Force	*
Lynchmob	Bridge	6
Original Superchess	CP Software	*
Tai	PSS	*
Tenpin	Phipps	*
ZX 1K Chess	Artic	*
ZX Compendium	Mastervision	7
ZX-Chess I	Artic	*

Utility

Graphics	IPA	*
Graphics Toolkit	JRS	9
HI Resolution	CRL	6
Machine Code Test Tool	OCP	*
MCoder	PSS	8
Programme Enhancement Package	R and R	*
Renumber Delete	Work Force	*
Trace	Texgate	7
ZX Compiler	Silversoft	*
ZX Screenkit	Picturesque	*
ZX-81 Remload	Picturesque	*
ZX-Bug	Artic	*
ZX-sideprint	Microsphere	*
ZXAS	Bug-Byte	*
ZXDB	Bug-Byte	*

SPECTRUM 16K

Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to Earth	Mikro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	New Soft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

Arcade

Aquarius	Bug-Byte	6
Arcadia	Beau Jolly	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Avenger	Abacus	5
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Bug Blaster	Crystal	*
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-Bug	dk'tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Crazy Cranes	Voyager	5
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Digger Dan	Ocean	*
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7
Fruit Machine	dk'tronics	6
Galactians	dk'tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Ghost Hunt	PSS	*
Gnasher	Mastertronic	4
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7
Ground Attack	Silversoft	6

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Software Directory

Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8
It's the Wooluf	Crystal	5
Jet Pac	Ultimate	8
Labyrinth	Axis	4
Leap Frog	CDS	*
Light Cycle	PSS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Storm	Quicksilva	7
Meteoroids	dk'tronics	7
Meteoroids	Softek	6
Micro Mouse	Lothlorien	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Mr Wong's Loopy Laundry	Artic	6
Muncher	Silversoft	*
Muncher	Silversoft	6
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softek	*
Rider	Virgin	6
Road Toad	dk'tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Frogs/ Showdown	Artic	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	Mastertronic	5
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dk'tronics	8
3D Monster Chase	Romik	3
Train Game	Microsphere	9
Trom	dk'tronics	4
Vortex	JK Greye	5
Winged Warlord	CDS	6
Wizard's Warriors	Abersoft	*
Yomp	Virgin	7

Business

Finance Manager	OCP	9
Home Computer Pack	SD Micro	*
Masterfile 16	Campbell	*
Matcalc	Work Force	*
Micropen	Contrast	*
Vu-Calc	Sinclair	7
Vu-File	Sinclair	8

Education

Alphabet	Widget	*
Alphabet Games	Sinclair	*
Apostrophe	Sinclair	7
Ballooning	Heinemann	*
Calpac 1-3	Calpac	*
Car Journey	Heinemann	*
Cargo	Sinclair	*
Chess Tutor	Artic	7
Counting	Starter Soft	*
Counting	Widget	*
Education One	Lerm	*
Educational	Startersoft	*
Firework Music	Soft Cottage	8
First Numbers	Collins	*
40 Education Games	Granada	*
Four Rules of Number	Micro Master	*
French Voc Test	Tutorial	*
Hidden Letters	Poppy	*
Hot Dot Spotter	Longman	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Know Your Tables	Collins	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Learn Basic	Logic 3	*
Learning Read 1	Poppy	*
Linear Programming	University	*
Marks Book	Lerm	*
Maths Invaders	Stell	*
Maths Tutor	AD Software	*
Matrix Operations	University	7
Money	Poppy	*
Night Sky	Bridge	*
O Level Maths	Homestudy	*
O Level Physics	Homestudy	*
Paddington's Shopping Mix-up	Collins	*
Pathfinder	Widget	*
Polynomials	University	8
Pre/early school cassettes	Essex	*
Primary Arithmetic	Rose	*
Punctuation Pete	Heinemann	*
Regression	University	8
Self-teach Program	Anvil	*
Shape Sorter	Widget	*
Special Agent	Heinemann	*
Spellbin	Startersoft	*
Use and Learn	Micrel	8

Language

Beta Basic	Betasoft	9

Practical

Biorythms	Spectrasoft	*
Countries of the World	Hewson	8
Cycle Planner	Medidata	4
Map of the UK	Kuma	7
Shopping List	SD	*
Spectasort	Spectadraw	4

Puzzle

Flippit	Sinclair	7
Hanoi King	Contrast	7
Lojix	Virgin	3
Nowotnik Puzzle	Phipps	7
Quazar	Rose	4

Simulation

Air Traffic Controller	Hewson	6
Airliner	Protek	6
Golf	R & R	7
Golf	Virgin	7
Golf	Virgin	8
NightFlite	Hewson	5
Print Shop	CCS	8
Pro-Golf	Hornby	7

Strategy

Auto Chef	CCS	*
Big Match Soccer	Winters	*
Dallas	CCS	6
Dictator	dk'tronics	*
Farmer	CCS	*
Football	Winters	*
Heathrow	Hewson	8
Las Vegas	Temptation	*
Quincy	Severn	*

Traditional

Backgammon	Hewson	*
Bridge Tutor	CP Software	8
Bridgemaster	Bridgemaster	9
Challenge	Temptation	*
Gambling Tape	Dymond	*
Las Vegas	Temptation	5
Odds-on	RSD	*
Othello	CP Software	*
Pinball	Winters	*
Pool	Bug-Byte	7
Reversi	Sinclair	8
Roulette	Newsoft	*
Solo Whist	Video Soft.	*
Spec. Microchess	Artic	*
Super Play I	Video	*
Tennis	Winters	*

Utility

Aspect	Bug-Byte	5
Audio Sonics	Work Force	4
Auto Sonics	Buttercraft	5
Basic Utilities	Jaysoft	6
Character Generator	Spectrasoft	*
Dictron	Custom	6
Disassembler	dk'tronics	7
Display	Work Force	*
Editor/Assembler	Picturesque	8
Extended Basic	CP Software	7
FP Compiler	Softek	9
Friendly Face	Monitor	7
Keysounder	S and G	*
Letterfont	Allanson	8
Machine Code Test Tool	OCP	7
Master Toolkit	OCP	7
MCoder	PSS	8
Micropen	Contrast	*
Print Utilities	Sinclair	7
Programmer's Dream	Work Force	8
Renumber Delete	Work Force	*
Slow Loader	ELR	9
Sound FX	dk'tronics	6
Spec. Bug	Artic	*
Spec. Editor/ Assembler	Picturesque	8
Spec. Monitor	Picturesque	7
Spectrum Super Toolkit	Nectarine	8
Spectsound	PDQ	2
Supercode	CP	8
Taswide-64	Tasman	*
Trace	Texgate	8
TT-S	Timedata	8
ZX Spectrum Assembler	McGraw Hill	4
ZXED	dk'tronics	*

SPECTRUM 48K

Adventure

Abyss	CCS	6
Ace in the Hole	Add-on	*
Adventure 1	Abersoft	6
Adventure Island	Contrast	*
Alchemist	Beau Jolly	7
Arcane Quest	Add-on	*
Atlas Assignment	Virgin	7
Black Crystal	Mastervision	7
Black Dwarf's Lair	New Soft	*
Black Planet	Phipps	7
Buffer Adventure	Buffer Micro	6
Byte	CCS	3
Castle	Bug-Byte	*
Castle Blackstar	SCR	7
Circus	Channel 8	8
Classic Adventure	Melbourne House	*
Colditz	Phipps	8
Colossal Caves	CP Software	8

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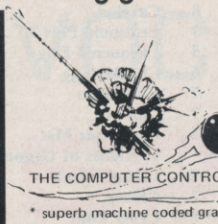

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Demon Lord	MCE	5
Detective	Arcade	7
Devils of Deep	Shepherd	*
Diamond Quest	CCS	4
Diamond Trail	Gilsoft	7
Dragonsbane	Quicksilva	6
Dungeon Master	Crystal Comp.	8
Dungeons of Doom	Temptation	3
Espionage Island	Artic	5
Everest Ascent	Sheperd	6
Fantasia Diamond	Hewson	7
Frog Face	Positive Image	7
Golden Apple	Artic	7
Gorgon	Phipps	*
Halls of Things	Crystal Comp.	9
Here comes the sun	Alligata	7
Hobbit	Melbourne House	9
Hole	Add-on	*
Horror Atoll	Add-on	*
Inca Curse	Artic	6
Inferno	Shepherd	7
Invincible Island	Shepherd	8
Island	Crystal	4
Island	Virgin	7
Jericho Road	Shards	7
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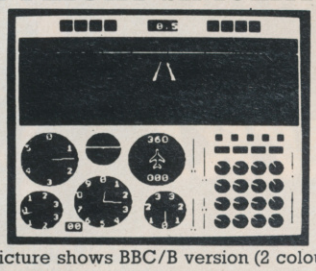

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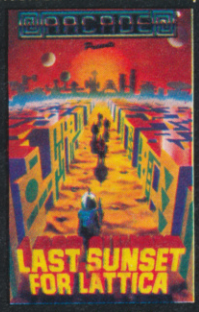

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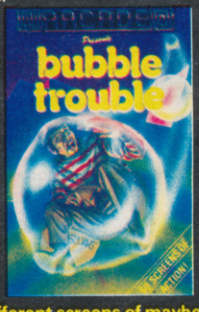

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Assembler Dev. Package	Metacomco	9

Software Publishers

A & F Software, Unit 8, Canalside Industrial Estate, Woodbine Street East, Rochdale, Lancashire OL16 5LB
Abacus Software, 21 Union Street, Ramsbottom, Nr Bury, Lancashire
Abbex, 20 Ashley Close, Manor Hall Drive, London NW4
Abersoft, 7 Maesfallen, Bow Street, Aberystwyth, Wales
Add-on Electronics, Units 2,3 & 4, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ
Addictive Games, 7a Richmond Hill, Bournemouth BH2 6HE
ADS, 8 Bronchurch Street, Portsmouth, Hampshire PO4 8RY
Allanson Computing, 77 Chorley Road, Adlington, Chorley, Lancashire PR6 9LH
Alligata Software, 1 Orange Street, Sheffield S1 4DW
APS, 1 Golden Square, London W1
Arcade Software, Technology House, 32 Chislehurst Road, Orpington, Kent BR6 0DG
Arnold Wheaton, Parkside Lane, Dewsbury Road, Leeds LS11 5TD
Artic Computing, Main Street, Brandesburton, Driffield YO25 8RG
Automata UK, 27 Highland Road, Portsmouth, Hampshire P04 9DA
Axis, 71 Brookfield Avenue, Loughborough, Leicestershire LE11 3LN
Beau-Jolly, 19A New Broadway, Ealing, London W5
Bellflower Software, 6 Rosewood Avenue, Greenford, Middlesex UB6 7QP
Betasoft, 92 Oxford Road, Moseley, Birmingham B13 9SQ
Beyond Software, 8 Herbal Hill, London EC1
Bridge Software, 36 Fernwood, Marple Bridge, Stockport, Cheshire SK6 5BE
Bridgemaster, Sandymouth, Beeches Road, Farnham Common, Buckinghamshire SL2 3PS
Buffer Micro, 310 Streatham High Road, London SW16
Bug-Byte, Mulberry House, Canning Place, Liverpool L1 8JB
Calpac Computer Software, 108 Hermitage Woods Crescent, St Johns, Woking, Surrey
Campbell Systems, 57 Trap's Hill, Loughton, Essex IG10 1TD
CCS, 14 Langton Way, Blackheath, London SE3 7TL
CDS Micro Systems, Silver House, Silver Street, Doncaster, South Yorkshire DN1 1HL
Chalksoft, 37 Willowslea Road, Northwick, Worcester
Cheetahsoft, 24 Ray Street, London EC1R 3DJ
Clever Clogs, Argus Press Software Group, 1 Golden Square, London W1R 3AB
Collins, 18/20 Stephenson Way, North Gower Street, London NW1 2DX
Computatutor, 3 Thalia Close, Greenwich, London SE10 9NA
Contrast Software, Warren Road, Liss, Hampshire GU33 7DD
Cornhill Software, 2 Penrith Way, Aylesbury, Buckinghamshire HP21 7JZ
CP Software, 1 Glebe Road, Uxbridge, Middlesex UB8 2RD
Creative Sparks, Thomson House, 296 Farnborough Road, Farnborough, Hampshire
Cross Software, 36 Langford Crescent, Barnet, Hertfordshire EN4 9EH
Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR3 3RX
Digital Integration, Watchmoor Trade Centre, Watchmoor Road, Camberley, Surrey GU15 3AJ
dk'tronics, Unit 6, Shire Hill Ind Est, Saffron Walden, Essex CB11 3A
Doric Computer Services, 3 The Oasis, Glenfield, Leicester LE3 8QS
Durrell Software, Castle Lodge, Castle Green, Taunton TA1 4AB
Dymond Software, 22 Hospital Road, Annan, Dumfriesshire DG12 5HP
East London Robotics, St Nicholas House, The Mount, Guildford, Surrey GU2 5HN
Eastmead, Eastmead House, Lion Way, Camberley, Surrey GU16 5EZ
Ebury Press, Humphrey Bull & Barker, 62 Dean Street, London W1V 5HG
Elm Computers, 59 Bateman Road, East Leake, Loughborough, Leicestershire LE12 6NN
Fantasy Software, Fauconberg Lodge, 27a St Georges Road, Cheltenham
Fawkes Computing, 41 Wolfridge Ride, Alveston, Bristol BS12 2RA
Felix Software, 19 Leighton Avenue, Pinner HA5 3BW
Fulwood, 20 Templestowe Hill, Whitkirk, Leeds LS15 7EJ
Gargoyle Games, 4 North Western Arcade, Birmingham BS 5LH
Gemini Software, 18a Littleham Road, Exmouth, Devon EX8 2QG
Gemtime Software Division, 16 Ben Ledi Road, Kirkcaldy, Fife KY2 5RP
Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan, South Wales
Gouldstone, 45 Burleigh Avenue, Wallington, Surrey SM6 7UG
Granada Publishing, 8 Grafton Street, London W1X 3LA
Griffin & George, Frederick Street, Birmingham B1 3HT
Harlequin Software, 43 Osprey Park, Thornbury, Bristol BS12 1LY
Hartland Software, 32 Ivor Place, London NW1 6DA
Heath Computing, 7 The Meadows, Flackwell Heath, Buckinghamshire HP10 9LX
Hessel, 15 Lythan Court, Cadwell Crescent, Sunningdale, Berkshire
Hestacrest, PO Box 19, Leighton Buzzard, Bedfordshire LU7 0DG
Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon
Hilderbay, 8/10 Parkway, Regents Park, London NW1 7AA
Hilton Computer Services, 14 Avalon Road, Orpington, Kent
Hisoft, 180 High Street, Dunstable, Bedfordshire LU6 1AT
Homestudy Ltd, Treleigh Woods Farm, Treleigh, Redruth, Cornwall TR16 4AW
Hornby Software, 21 Penfold Hill, Leeds LS15 0PW
Image Systems, 34 Lynwood Drive, Worcester Park, Surrey KT4 7AB
Incentive, 54 London Street, Reading, Berkshire RG1 4SQ
Inform Software, 3 Treesdale Close, Birkdale, Southport PR8 2EL
Interstella Software, 82 New Forest Drive, Brockenhurst, Kent
ISP Marketing Ltd, Crown Hill, 38B High Street, Godalming, Surrey GU7 1DZ
JK Greye Software, 16 Park Street, Bath, Avon BA1 2TE
JRS Software, 19 Wayside Avenue, Worthing, Sussex BN13 3JH
K-Tel International (UK), 60 Western Avenue, London W3 0TU
Kemp, 43 Muswell Hill, London N10 3PN
Keysoft, 6 Bruce Grove, Tottenham, London N17
Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Bedfordshire LU5 6LX
Kuma Computers, 12 Horseshoe Park, Pangbourne, Berkshire RG8 7JW
Legend, PO Box 435, London E4 7LX
Lerm, 10 Brunswick Gardens, Corby, Northamptonshire
Level Nine, 229 Hugenden Road, High Wycombe, Buckinghamshire HP13 5PG
Logic 3, Unit 18, Wye Ind Est, London Road, High Wycombe, Buckinghamshire
Longman, Longman Group, Longman House, Harlow, Essex CM20 2JE
Lothlorien, 56a Park Lane, Poynton, Stockport, Cheshire SK12 1RE
Manor Software, 24 Manor Gardens, London SW20
Martech Games, 9 Billingburgh Road, Eastbourne, East Sussex BN20 8LY
Mastertronic, (as for Mastervision)
Mastervision, Park Lorne, 111 Park Road, London NW8 7SL
McAlley, 1 Cowleaze, Chinnor, Oxfordshire OX9 4TD
McGraw Hill, Shoppen Hangers Road, Maidenhead, Berkshire
Medidata, PO Box 26, London NW9 9BW
Melbourne House, Castle Yard House, Castle Yard, Richmond TW10 6TF
Micro Dealer UK, Unit 6, Marlborough Road Trading Estate, Lattimore Road, St Albans, Hertfordshire
Microbyte, 19 Worcester Close, Lichfield, Staffordshire
Microcosm, 68 The Glade, Clayhall, Ilford
Micromania, 14 Lower Hill Road, Epsom, Surrey KT19 8LT
Micromega, 230/236 Lavender Hill, London SW11
Microsphere, 72 Roseberry Road, London N10 2LA
Mikro-Gen, 44 The Broadway, Bracknell, Berkshire RG12 1AG
Minatron Computing, 34 Pinewood Close, Westbury on Trym, Bristol BS9 4AJ
Mirrorsoft, PO Box 50, Bromley, Kent BR2 9TT
Monitor Software, PO Box 442, London NW7 2JF
Mosaic, 187 Upper Street, London N1 1RQ
MW Gamesworld, 12 Lawnswood Avenue, Chasetown, Walsall WS7 8YD
Myrmidon Software, PO Box 2, Tadworth, Surrey KT20 7LU
Naigram Software, c/o Soho Synth House, 18A Soho Square, London W1V 5FB
Nectarine, 837 Yeovil Road, Slough SL1 4JH
Newsoft, 12 White Broom Road, Hemel Hempstead, Hertfordshire
NTD Software, 19 Radipole Road, London SW6

Oasis Software, 9a Alexandra Parade, Weston-Super-Mare, Avon BS23 1QT
Ocean Software, 6 Central Street, Manchester M2 5NS
OCP, 4A High Street, Chalfont St Peter, Buckinghamshire SL9 9QB
Orwin Software, 26 Brownlow Road, Willesden, London NW10 9QL
Penguin, 536 King's Road, London SW10
Phipps Associates, 172 Kingston Road, Ewell, Surrey

Continued on page 230

Software Directory

Continued from page 229

Phoenix Publishing, 14 Vernon Road, Bushey, Hertfordshire WD2 2JL
Picturesque, 6 Corkscrew Hill, West Wickham, Kent BR4 9BB
Poppysoft, The Close, Common Road, Headley, Newbury, Berkshire
Print 'n' Plotter Products, 19 Borough High Street, London SE1 9SE
Protek Computing, 1a Young Square, Brucefield Ind Park, Livingston, West Lothian
PSS, 452 Stoney Stanton Road, Coventry CV6 JDG
Pulsonic, Warwick Distribution Ltd, 3 Standard Road, Park Royal, London NW10 6EX
Quicksilva, Palmerstone Park House, Southampton, Hampshire S01 1LL
R and R, 34 Burton Road, Gloucester GL4 0LE
RAM Writer, 3 Vumba House, 2 Cedar Gardens, Sutton, Surrey
Ramtop Services, 5 Rue D'Artois, 75008, Paris, France
Red Shift, 12c Manor Road, Stoke Newington, London N16 5SA
Romantic Robot, 113 Melrose Avenue, London NW2 4LX
Romik Software, 272 Argyll Avenue, Slough SL1 4HE
Rose Software, 148 Widney Lane, Solihull, West Midlands
Runesoft, Charnwood House, Crossgate Drive, Nottingham NG2 TLW
Salamander Software, 27 Ditchling Rise, Brighton, East Sussex BN1 4QL
Scisoft, 5 Minster Gardens, Newthorpe, Eastwood, Nottingham NG16 2AT
SCR Adventures, 190 Shelbourne Road, Tottenham, London
SD Microsystems, 9 Cadwell Court, Hitchin, Hertfordshire SG4 0AQ
Selec Software, 37 Councillor Lane, Cheadle, Cheshire
Serim Software, Freepost, Dept SU7, PO Box 163, Slough, Berkshire SL2 3YY
Shards, Suite G, Roycraft House, 15 Linton Road, Barking, Essex
Shepherd Software, Elm House, 23–25 Elmshott Lane, Chippenham, Slough, Berkshire
Silversoft, London House, 271/273 King Street, London W6 9LZ
Sinclair Research, 6 Kings Parade, Cambridge
Soft Cottage, 19 Westfield Drive, Loughborough, Leicestershire LE11 3QJ
Soft Tech, 31 Lampits, Hoddesdon, Hertfordshire
Softek International, 12/13 Henrietta Street, Covent Garden, London WC2E 8LH
Softel, 5 Durward Drive, Glenrothes, Fife KY6 2LB
Software Farm, 155 White Ladies Road, Clifton, Bristol BS8 2RG
Software Projects, Bear Brand Complex, Allerton Road, Woolton, Liverpool, Merseyside L25 7SE
Spartan CC, 29 Feltham Avenue, East Moseley, Surrey KT8 9BJ
Spectadraw, 1 Cowleaze, Chinnor, Oxfordshire OX9 4TD
Spectrasoft, Capital House, Market Place, London W3 6AL
Startersoft, 32 Parkfields, Chippenham, Wiltshire
Stell Software, 36 Limefield Avenue, Whalley, Lancashire BB6 9RJ
Stratagem Cybernetics, 286 Corbin Place, 2E, Brooklyn, New York 11235
Sulis Software, 4 Church Street, Abbey Green, Bath BA1 1FP
Sunshine Books, 12/13 Newport Street, London WC2
Sussex Publication, Townsend Poulshot, Devizes, Wiltshire SN10 1SD
Tasman Software, 17 Hartley Crescent, Leeds LS6 2LL
Temptation Software, 27 Cinque Ports Street, Rye, East Sussex
Terminal Software, Derby House, Derby Street, Bury BL9 0NW
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Think Tank, 35 Wellington Road, Wimbledon Park, London SW19
Timedata, 16 Hemmells High Road, Laindon, Basildon, Essex SS15 6ED
Transform, 41 Keats House, Porchester Mead, Beckenham, Kent
Tutorial Software, 'Vilands', Glasllwch Lane, Newport, Gwent NP1 3PS
Ultimate Play the Game, The Green, Ashby de la Zouche, Leicestershire LE6 5JU
Unicorn Micro Systems, 312 Charminster Road, Bournemouth BH8 9RT
University Software, 29 St Peters Street, London N1
Vega Space Systems, 28 Watford Road, St Albans AL1 2AJ
Virgin Games, 2–4 Vernon Yard, London W11
Visions, 1 Feldgate Mews, Studlands Street, London W6
Vortex Software, 280 Brooklands Road, Brooklands, Manchester M23 9HD
Widgit Software, 48 Durham Road, London N2 9DT
Wilcox Software, Station Road, Walsall WS7 6JZ
Winters, 24 Swannington Close, Cantley, Doncaster, South Yorkshire
Woosoft, 5 Andrews Close, Robertsbridge, Sussex TN32 5PB
Workforce, 140 Wilsden Avenue, Luton, Bedfordshire
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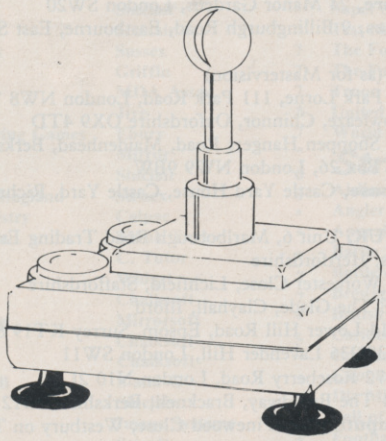

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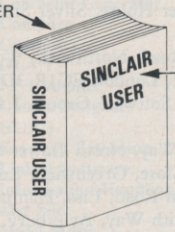

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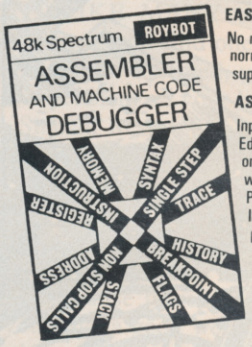

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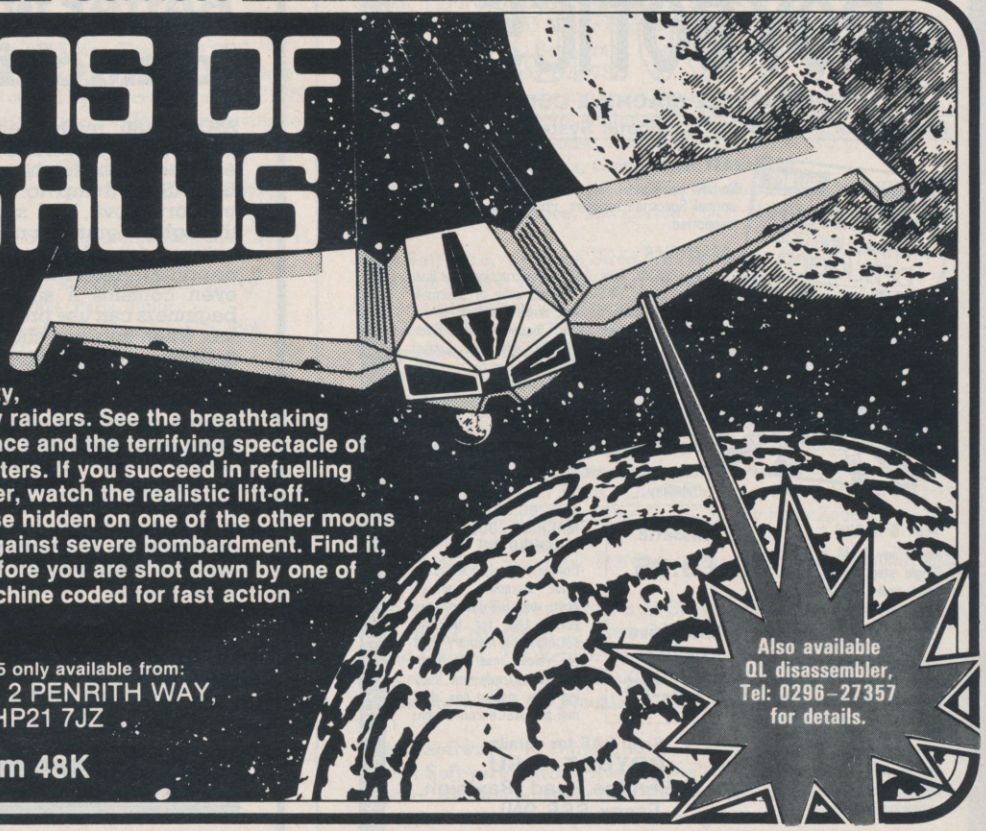

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Sinclair spares and repairs

IF, LIKE MANY other Spectrum owners, you find one day that your computer has died, you will have a major problem on your hands. Phoning the Sinclair Research customer relations department in Camberley will not help very much either.

If your electronics knowledge is limited, then you will decide to send your Spectrum to one of the companies who specialise in repairing computers. If you have a good working knowledge of electronics then the addresses listed below should enable you to obtain most replacement parts to repair your computer. Some of the simpler repairs, such as those involving keyboards can be undertaken by those with limited knowledge.

If your computer is under guarantee then it is important that you do not invalidate that guarantee. Talk to the customer service division at Sinclair Research and they will tell you where to send it. When returning the computer put a note in describing the fault as briefly as possible, as this will speed the repair process.

Suppliers of Sinclair parts:

Adaptors and Eliminators, 14 Thames Street, Louth, Lincolnshire. (050782) 8011. Spectrum and ZX-81 power supplies.

ASTEC (UK), 16 Albury Close, Reading, Berkshire. (0734) 53067. Supplies modulators for all countries PAL, NTSC, SECAM.

CPC, 194-200 North Road, Preston, Lancashire. (0772) 555034. Supplies all parts for Spectrum, ZX-81, ZX printer, ZX RAM pack including all case parts, power supplies and keyboard parts. Probably the best place to get ULA, ROM, case parts and keyboard.

Ferranti Semiconductors, Computer Road, Hollinwood Avenue, Oldham, Lancashire. (061) 682 6844, (061) 624 0515/6661. Supplies Spectrum and ZX-81 ULA.

Maplin Electronics, Southend on Sea, Essex. (0702) 552961. Supplies general components and data and technical books.

National Semiconductors (UK) Ltd, 301 Harpur Centre, Horne Lane, Bedford. (0234) 47147. Supplies Spectrum RAM/74LS series TTL; LM 1889 video chip.

NEC (UK) Ltd, Block 3, Carfin Industrial Estate, Motherwell. (0698) 73221. Supplies Spectrum ROM and RAM/74LS TTL; Z80A.

Sendale Plastics Ltd, Ramsey Road, St Ives, Cambridge. (0480) 62095. Supplies ZX-81 and Spectrum case parts.

Sinclair Research Ltd, Camberley, Surrey. (0276) 685311.

Texas Instruments, Manton Lane, Bedford, Bedfordshire. (0234) 223000, (0234) 211655. Supplies RAM 4116, 4532, 4164, 74LS TTL (Spectrum).

Timex Corporation, Camperdown Plant, Harrison Road, Dundee, Tayside. (0382) 819211. Makers of Spectrum, ZX-81, Printer, Interface one, Microdrives, RAM Pack. Repair and service for Sinclair.

Verran (Computerfix), Units 2H & 2J, Albany Park, Frimley Road, Camberley, Surrey. (0276) 66266. Repairs Spectrums and ZX-81.

Zilog (UK) Ltd, Zilog House, 45-53 Moorbridge Road, Maidenhead, Berkshire. (0628) 39200. Supplies Z80A.

Component companies

SOME OF THE large companies mentioned above do not like dealing directly with the public. The following is a list of component companies which should be happy to deal with you. Most will have catalogues available and will supply data sheets for their products on demand.

These firms are only distributors and they do not make components. If you have a problem with a particular device contact the manufacturer as listed above because not many of the distributors can answer technical questions; RS Components, Farnell, Ambitt and Hawkes may do. Anyone needing NEC parts should phone them direct and ask for some distributors dealing with them.

Abacus Electronics, Kennet House, Pembroke Road, Reading, Berkshire. (0734) 33311. Makes dealt with: National Semiconductors, SGS.

Access Electronic Components Ltd, Austin House, Bridge Street, Hitchen, Hertfordshire. (0462) 57244. Makes dealt with: National Semiconductors.

Alpha Electronic Components Ltd, 66 Wilbury Way, Hitchin, Hertfordshire. (0462) 57244. Makes dealt with: National Semiconductors.

AM Lock Distribution Ltd, Nevill Street, Middleton Road, Oldham, Lancashire. (061) 652 0431. Makes dealt with: Motorola, Mostek.

Anzac Components Ltd, Burnham Lane, Slough, Buckinghamshire. (06286) 4701. Makes dealt with: Hitachi.

Axion Electronics Ltd, Unit F, Turnpike Road, Cressex Industrial Estate, High Wycombe, Buckinghamshire. (0494) 442181. Makes dealt with: Motorola.

BA Electronics Ltd, Millbrook Road, Yate, Bristol. (0454) 315824. Makes dealt with: Texas Instruments.

Celdis Ltd, 37-39 Loverrock Road, Reading, Berkshire. (0734) 585171. Makes dealt with: Motorola, Mostek.

Crellon Electronics Ltd, 380 Bath Road, Slough, Berkshire. (06286) 4434. Makes dealt with: Motorola, SGS, Zilog.

Dialogue Distribution Ltd, Watchmore Road, Camberley, Surrey. (0276) 682001. Makes dealt with: Hitachi.

DTV Group, 10-12 Earnest Avenue, West Norwood, London SE27. (01) 670 6166. Makes dealt with: National Semiconductors.

Farnell Electronic Components Ltd, Canal Road, Leeds. (0532) 636311. Makes dealt with: Hitachi, National Semiconductors.

Hawke Electronics Ltd, Amotex House, 45 Hanworth Road, Sunbury on Thames, Middlesex. (01) 979 7799. Makes dealt with: Motorola, Texas Instruments. Will answer technical queries.

Hill Electronics (NI) Ltd, 290 Antrim Road, Belfast, Northern Ireland. Makes dealt with: Mostek.

ITT Multicomponents, Edinburgh Way, Harlow, Essex. (0279) 442971. Makes dealt with: Motorola, National Semiconductors, SGS, Texas Instruments and Hitachi.

Macro Marketing Ltd, Burnham Lane, Slough, Berkshire. (06286) 4422. Makes dealt with: Motorola, National Semiconductors, Zilog, Texas Instruments.

Quarndon Electronics Ltd, Slack Lane, Derby. (0332) 32651. Makes dealt with: Texas Instruments.

STC Electronics, Edinburgh Way, Harlow, Essex. (0279) 26777. Makes dealt with: Motorola, National Semiconductors, SGS, Texas Instruments and Hitachi.

Computer parts

Z80A: Zilog, SGS, NEC (Spectrum/ZX-81).

ULA: Ferranti (Spectrum/ZX-81).

ROM: Hitachi, NEC (Spectrum), Mostek, Motorola (ZX-81).

RAM: 4116 type — NEC, National Semiconductors, Texas Instruments, ITT (Spectrum). 4532 type — Texas Instruments, OKI (Manhattan Skyline) (Spectrum). 2114 type — Motorola, NEC (ZX-81). 4118 type — Mostek (ZX-81). 2K type — Mostek, Toshiba, Motorola, Texas Instruments, NEC (ZX-81).

LM1889: ICI4 — National Semiconductors (Spectrum).

TTL: 74LS00/74LS32/74LS157 — Texas Instruments, SGS, Motorola, National Semiconductors, NEC.

The following are all used on the 48K Spectrum.

Regulator: LM7805 +5V Reg. — SGS, NEC, Texas Instruments, Motorola.

Crystals, Capacitors, Resistors, Diodes, Sockets: available through general component suppliers.

Modulator: UM1233 Astec (UK) Ltd.

Leads: available at most TV/electrical shops.

Case parts: Sendale Plastics.

Keyboard: CPC.

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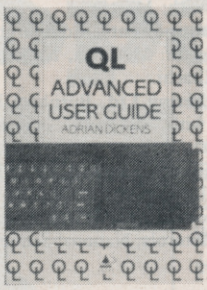

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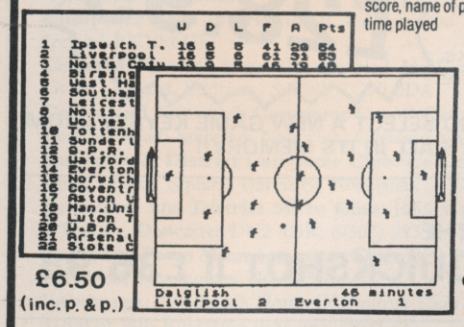

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Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

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Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80–81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other Wednesday.

Glasgow ZX-80–81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241).

Gloucester: Mid-weekly Spectrum User Group. Barry Ledbury, 8 Linnet Close, Gloucester GL4 9XA (0452) 23186.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Hobbit Appreciation Society, 12 Middlefield Lane, Hinckley, Leicestershire LE10 0RB. Free newsletter with SAE.

Independent QL Users Group; Brian Pain, 24 Oxford Street, Stony Stratford, Milton Keynes MK11 1JU. Tel: 0908 564271. Publishes newsletter.

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meets every other Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

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Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Keith Archer, 031-236 6109 (daytime).

Llanelli Computer Club: 40 Tan-Y-Bryn, Burry Port, Dyfed. Llanelli 56917.

Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

Meopham: National ZX Spectrum User Club. Guy Fullalove, Woodcotes, Camer Park, Meopham, Kent DA13 0XS. Bi-monthly newsletter, subscription £1.50. Send SAE for details.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Surrey KT19 0SY.

Mid-Kent Micro Club: Meets once monthly. Enquiries to M Gates, 65 Buckland Road, Maidstone ME16 0SH.

Mill Lane Association Computer Group: Bryan McAlley, 1 Cowleaze, Chinnor, Oxfordshire. (0844) 52426.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30. Enquiries to R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 Monday, 6pm.

Nottingham Microcomputer Club: ZX-80–81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Roche Computer Club: 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473. Twice weekly meetings, Monday and Friday.

Saltcoats Computer Club: Colin Borland, 117 High Road, Saltcoats, Ayrshire KA21 5SD. Weekly meetings.

Sinclair Postal User Group: 24 St. Mary's Way, Code SUL, Chigwell, Essex IG7 5BX. Produces magazine with competitions.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sinclair Amateur Radio User Group: SAE or two IRCs for details. Paul Newman G4 1NP, 3 Red House Lane, Leiston, Suffolk IP16 4JZ.

Sittingbourne: Anurag Vidyarth (0795 73149).

St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. (0727 54176).

Stratford-on-Avon Computer Club: Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

Washington Sinclair Users' Club, Columbia Community Centre, Tyne and Wear. Meets twice a month, tel. 4179483 or 4167367.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068).

Universal ZX Club: Postal club for Spectrum owners in the U.K. and abroad. C. Shaw, 1 Swiss Walk, Batley, W. Yorkshire.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

Overseas

Australia: Australian ZX Users' Newsletter, incorporating QL User. Paul Janson, P.O. Box 397, Dapto 3530, Australia. Also seeks unpaid contributions for the newsletter.—W.A. ZX Users' Group, Garth Gregson, 34 Chester Street, South Fremantle 6162. Phone 3351671.

Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

Belgium, France and Luxembourg: Club Micro-Europe, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (32/2/6537468).

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

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Finland: ZX-kerho, c/o Kalevi Hamalainen, Siltakatu 9 A 8, 33100 Tampere 10, Finland. Phone 35831-34238. Publishes quarterly paper.

France: Yves Chapron, no. SUS-1047, Rue du Puy, La Terrasse, 38660 Le Touvet, France. Specifically for users in the Alps.

Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

Greece: Athens Spectrum Club, Paris Stamelos, Spetsou 2, isi22 Marousi, Athens, Greece.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.

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Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

The Netherlands: Clive's Bits and Bytes, Nicholas Beets Straat 164, 6416 VX Heerlen. Telephone 045-423024. Both Spectrum and ZX-81 users welcome.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.
Dumont and Syndercombe Amateur Computer Club. Jean-Pierre Dumont would like to correspond with ZX-81 owners via tapes. Write to 8 Kipling Road, Farrarmere, Benoni 1500, Transvaal.

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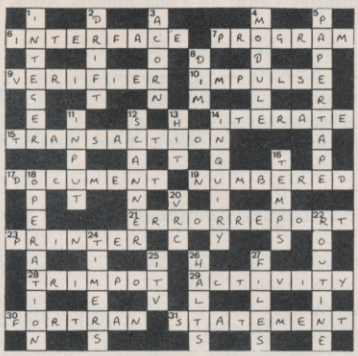
Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).—SAF Users' Group, 2749 Eden Road, Leslie, Michigan 49251.—ZX Users Group of New York, Box 560 Wall Street, New York, N.Y. USA 10005. Subscription $15US, publishes international newsletter. Seeks newsletter exchange with other groups.

Solution to crossword



Answers to MIND GAMES

1. Slaymore loses the argument but wins the fight.
2. MS. The author's name is Mike Singleton. The two characters which must fight or fulfill the quest are Luxor and Morkin.
3. Mastervision which is part of Mastertronic. **Volcanic Dungeon, Black Crystal, Wrath of Magra.**
4. A tree structure is generated by a computer and contains the possible moves in a strategy game from which winning moves can be deduced. It is infinite.
5. Scott Adams wrote The Hulk. Banner is bound to a chair in the control room. Transformation occurs when he bites his lip.
6. Henry.
7. Ringways. Could have been Ofnir, Drapnir, Skornir, Skalir, Felstrong or Grimnir.
8. Rope a boat to cross the river. The ring is by the lake or with Gollum. Bard kills Smaug with an arrow.
9. Paddington, Victoria, or Aldgate by hansom cab. Mrs Brown and Mrs Jones were murdered. The name of the paper read by Watson is The Daily Chronicle.
10. A grandfather clock. Nine time periods. In the clock.

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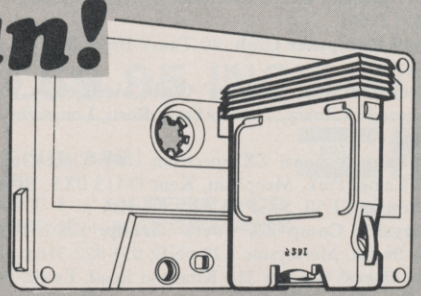

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DPOKE double poke
EDIT specified line
ELSE (used with IF...THEN)
EXIT leave DO-LOOP
FILL enclosed area with specified ink or paper
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JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
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POKE a string
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UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BIN£ decimal to binary
CHAR$ number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modules
NUMBER 2 characters to number
OR (bit-by-bit)
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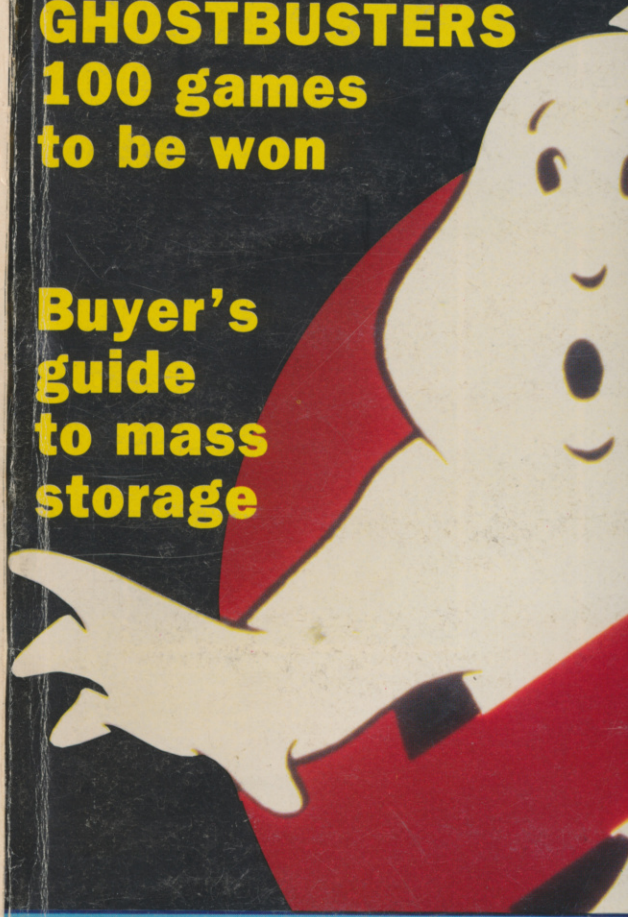

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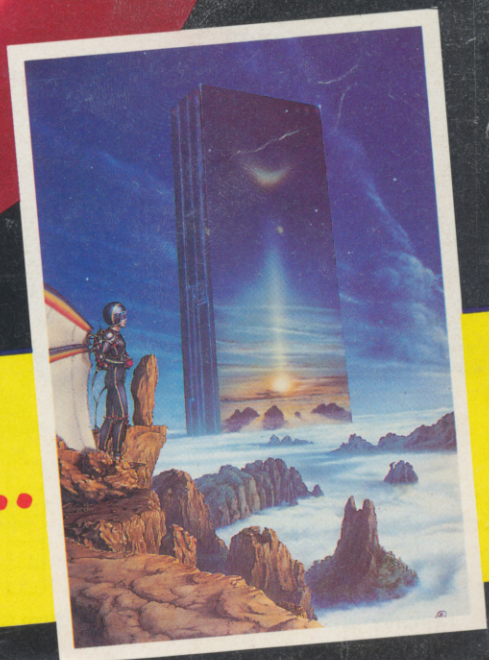

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